DOCUMENT RESUME

ED 123 475 CE 007 265

TITLE	Ship's Serviceman Laundry Handbook: Rate Training Manual and Non-Resident Career Course.
INSTITUTION	Naval Education and Training Command, Pensacola, Fla.
REPORT NO	NAVEDTRA-10293
PUB DATE	76
NOTE	232p.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (Stock Number 0502-LP-051-4650)
EDRS PRICE	MF-$0.83 HC-$12.71 Plus Postage.
DESCRIPTORS	*Clothing Maintenance Specialists; Course Content; Individual Instruction; *Instructional Materials; *Job Training; *Manuals; *Military Training; Technical Education; Textiles Instruction
IDENTIFIERS	Laundrymen; Navy

ABSTRACT

The manual and course form a self study package that enables laundrymen to fulfill the requirements of the Ship's Serviceman (Laundry) rating. Chapter 1 provides information regarding the administration of ship's service activities (equipment maintenance, supervisory responsibilities, and procurement of supplies). Chapters 2 through 12 cover the following topics: laundry organization and management, fibers and fabrics, washing, extracting and drying, flatwork ironing, pressing and finishing, assembly and issue, drycleaning and finishing, removal of spots and stains, decontaminating and disinfecting, and portable laundry equipment. Photographs and diagrams supplement the narration. The set of assignments in the Nonresident Career Course include learning objectives and supporting questions designed to guide students through the manual. A list of commonly used Federal supply laundry products, a glossary, an explanation of the metric system, a subject index, and a 37-page nonresident career course assignment booklet conclude the document. (Author/BP)

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SHIP'S SERVICEMAN LAUNDRY HANDBOOK

JUN 1 4 1976

NAVAL EDUCATION AND TRAINING COMMAND

RATE TRAINING MANUAL
AND NONRESIDENT CAREER COURSE

NAVEDTRA 10293

CE 007 265

PREFACE

This Rate Training Manual and Nonresident Career Course (RTM/NRCC) form a self-study package that will enable Laundrymen to help themselves fulfill the requirements of their rating. Among these requirements are the abilities to operate laundry equipment, such as washer-extractors, tumbler-dryers, presses, and flatwork ironers, to wash and finish washable garments; spot, clean, dry, deodorize, and press nonwashable clothing and materials using equipment such as drycleaning machines, steam presses, steam-air-finishers, and steam cabinets; apply knowledge of effects of Navy washing formulas, cleaning solvents, stain removing agents, and heat in cleaning fabrics of various textures; plan the flow of work, distribute and coordinate duties, and maintain records; and train assistants in shipboard laundry procedures.

Designed for individual study and not formal classroom instruction, the RTM provides subject matter that relates directly to the occupational qualifications of the Ship's Serviceman (Laundry) rating. The set of assignments in the NRCC includes learning objectives and supporting questions designed to lead students through the RTM.

This training manual and the nonresident career course were prepared by the Naval Education and Training Program Development Center, Pensacola, Florida, for the Chief of Naval Education and Training. Technical assistance was provided by the Navy Resale System Office, Brooklyn, New York; Naval Ship Engineering Center, Hyattsville, Maryland; Naval Ship Engineering Center, Mechanicsburg, Pennsylvania; and the Fleet Training Center, Norfolk, Virginia.

Revised 1976

Stock Ordering No.
0502-LP-051-4650

Published by
NAVAL EDUCATION AND TRAINING SUPPORT COMMAND

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON, D.C.: 1976

THE UNITED STATES NAVY

GUARDIAN OF OUR COUNTRY

The United States Navy is responsible for maintaining control of the sea and is a ready force on watch at home and overseas, capable of strong action to preserve the peace or of instant offensive action to win in war.

It is upon the maintenance of this control that our country's glorious future depends; the United States Navy exists to make it so.

WE SERVE WITH HONOR

Tradition, valor, and victory are the Navy's heritage from the past. To these may be added dedication, discipline, and vigilance as the watchwords of the present and the future.

At home or on distant stations we serve with pride, confident in the respect of our country, our shipmates, and our families.

Our responsibilities sober us; our adversities strengthen us.

Service to God and Country is our special privilege. We serve with honor.

THE FUTURE OF THE NAVY

The Navy will always employ new weapons, new techniques, and greater power to protect and defend the United States on the sea, under the sea, and in the air.

Now and in the future, control of the sea gives the United States her greatest advantage for the maintenance of peace and for victory in war.

Mobility, surprise, dispersal, and offensive power are the keynotes of the new Navy. The roots of the Navy lie in a strong belief in the future, in continued dedication to our tasks, and in reflection on our heritage from the past.

Never have our opportunities and our responsibilities been greater.

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CREDITS

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Ajax Pressing Machine Co.	7-8, 7-9
American Laundry Machine Co.	6-1, 6-4, 6-5 12-1, 12-2
Cissell, W.M. Mfg., Co.	5-4
Colmac Industries, Inc.	7-6
Pellerin Milnor Corp.	4-1, 5-2
Textile Marking Machine Co., Inc.	2-9
Vic Cleaning Machine Co.	9-7

CHAPTER 1

ADMINISTRATION OF SHIP'S SERVICE ACTIVITIES

There are many types of service activities authorized for ships. The number of these to be found aboard a particular ship is governed by such factors as size and type of ship, number of personnel assigned, and space available. A destroyer, for example, cannot provide all the services available on a carrier.

All ships with Supply Corps officers have at least the basic three activities: laundry, barbershop, and vending machine. Vending machines are discussed in *Ship's Serviceman 3 & 2*, NAVPERS 10286-F. As the size increases, the range of service activities may expand to include a tailorshop and drycleaning facility. For the majority of ships the expenses incurred in operating the service activities are paid from profits derived from sales in the ship's store resale activities.

The commanding officer may decide to collect a monthly laundry and drycleaning charge to cover the cost of operating all service activities. This is the only charge authorized; no charge can be made for haircuts or other services. Commanding officers seldom require such a collection except at times when store profits are insufficient to cover costs.

Service activities are administered by the ship's store component of the supply department. On ships with Supply Corps officers the supply officer or one of his designated assistants acts as the ship's store officer. On ships without Supply Corps officers, the commanding officer appoints an officer to act as the ship's store officer. Each service activity is supervised by a Ship's Serviceman specialist (Barber, Tailor, Laundryman).

Ship's Servicemen probably contribute more to the welfare and contentment of men in the Navy than any other rating. Service is their watchword. You can be sure that the overall morale of your ship will be greatly increased when efficient laundry and drycleaning services, tailoring, and barbering are furnished.

You must remember that as a Ship's Serviceman, you are performing a service. In performing this service, you should acquire the habit of doing high quality work and of being fair and considerate. Always establish good customer relations by turning out high quality work and by treating the customer as you would like to be treated.

MAINTENANCE OF EQUIPMENT

As a Ship's Serviceman in charge of the laundry, it will be your responsibility to ensure that all machinery in the laundry is thoroughly inspected before beginning the daily operations. Machinery must be carefully examined for loose nuts, bolts, parts, connections, and the like; this is especially important when the equipment is in constant use.

A thorough inspection of machinery should also be made after firing the guns and upon completion of any structural tests to which the ship may be subjected.

Even though the actual maintenance of equipment located in ship service spaces is the responsibility of the engineering department, supervisors and operators of the equipment should ensure that regularly scheduled maintenance is performed on the equipment. Create and maintain a good and effective working relationship with those in the engineering department who are responsible for this maintenance.

Personnel other than maintenance men are not permitted to make repairs other than routine adjustments. Under no circumstances should the speed of machinery be maintained in excess of that prescribed by the manufacturer.

SUPERVISORY RESPONSIBILITIES

A service activity supervisor should set aside a definite portion of his time for checking the work being processed in the activity under his charge. This includes the work of each person, for only by checking the finished product and the method by which the work was done, can the supervisor find out why the work is satisfactory or not up to par.

The important thing to remember about supervision is that your men will respect you for your interest in them and in the work your section does. They will not take pride in their work unless you exhibit interest and pride as an example to them. They will not resent constructive criticism if they feel you have their interest at heart and threat them with respect. Talk to them quietly, preferably in privacy. If you shout at people or reprimand them in the presence of other workers, the effect is usually bad. Be positive, but be fair.

Another responsibility of supervisors is training. By observing your men at work, you can determine what they should learn about the job. Most of your instruction will be given on-the-job, but sometimes you may find other types of instruction more suitable. The next few sections discuss some of the basic training methods.

WHAT YOUR MEN SHOULD LEARN

Your men should learn to do all types of work in their specialty. The first thing you must find out, therefore, is what each man can do. You can learn this from his record, by talking with him, by observing him at work, and by checking his finished work.

Refer to the occupational standards listed in the *Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards,* NAVPERS 18068-D. Here you will find the things the worker in your specialty must be able to do in order to advance in rating. Your training should therefore be geared to these objectives; but it need not be limited by them. The rate column of the Enlisted Occupation Standards, Section I, NAVPERS 18068-D gives you some guidance in establishing what to teach, but you will have to break each subject down further. Some subjects have a natural priority. Safety regulations fall in this category, and so do the precautions designed to prevent damage to the articles serviced and to the machinery used in servicing such articles.

Set up a timetable. Ask yourself, "How much skill should the man have? How much skill is he capable of obtaining? By what date?"

Start with the easier tasks and move toward the more difficult. Give the trainee time to learn one thing thoroughly before you start him on something new.

GETTING READY TO INSTRUCT

Like any other important job, instruction requires forethought and preparation. When you know what you want to teach, the next step is to select the most suitable method of instruction. For instance, are you going to recommend a book for the trainees to study, give them a demonstration, or provide a job instruction sheet and let them teach themselves? The choice will depend on the subject you wish to teach. For example, laundry operations lend themselves to demonstrations supplemented by study of textbooks and technical manuals. In a large plant you may occasionally give a demonstration formally to a group. You may also use the demonstration method for teaching one individual. Since most laundry instruction is on-the-job instruction, you will find the ability to give a good demonstration a distinct asset.

In preparing for a demonstration, as for any other type of lesson, ask yourself first what background knowledge the trainees need in order to understand and learn what you plan to present. See that your trainees have the necessary knowledge before you give the demonstration.

Next, analyze exactly what you are going to do. Make a list of all the equipment and materials you will need. Break the process down into its component steps. Write these steps down to make sure that in your familiarity with the subject you have not overlooked something.

Below is a sample plan for a demonstration for Laundrymen.

PLAN FOR DEMONSTRATION

Subject: Removal of chewing gum from items of uniform.

Background required: Acquaintance with spotting board and spotting tools. Practice in handling spatula, spotting brush, and steam gun. Instruction in correct way to sponge.

Materials:
- Squares of cotton duck (white uniform material) and wool (blue uniform material)
- Spatula, spotting brush
- Blotter or absorbent cloth
- Spotting board and steam gun
- Turpentine
- Hot water
- Detergent
- Dry-cleaning solvent
- Two pans

Preliminary explanation: The base of chewing gum is likely to be chicle gum or parafin. Sugar and flavoring may also be present. Often a large portion of the gum can be removed mechanically from the surface of the cloth. Next the gum or paraffin that has penetrated the cloth should be dissolved in appropriate solvent. If any sugar stains remain they should be removed by sponging with water, or by washing or dry cleaning, as appropriate.

Demonstration:

A. Removal of gum from washable fabric

1. Display the square of white duck with the gum stuck to it.
2. Place the fabric on the spotting board and lift off as much gum as possible with spatula.
3. Use the spotting brush to remove as much of the remainder as possible.
4. Spot with turpentine.
5. Make suds with detergent and hot water in pan, and wash the square. (This should remove all traces of gum stain.)

B. Removal of gum from woolen fabric

1. Display woolen square with gum stuck to it.
2. Use spotting tools, as before, to remove as much of the gum mechanically as possible. (This can be used as a review of the previous part of the demonstration by asking the trainees to tell what should be done next. Remind trainees to use special care to avoid matting woolen fabric.)
3. Spot with turpentine.
4. Use a steam gun to remove remaining stain; or sponge with water.
5. Use air to blow the material dry.
6. If any spot or ring remains, rinse in a pan of dry-cleaning solvent and dry again. (Spot should now be entirely removed.)

REPETITION AND PRACTICE

Notice that in the demonstration plan above, it is suggested that parts of section B may be used to review section A. To ensure that the trainee retains all steps in a process, it is often best to repeat a demonstration in four stages. These are:

1. The instructor performs the demonstration, carefully explaining each step as he does it.
2. The instructor repeats the demonstration, but this time the trainee tells him how to do each step.
3. The trainee performs the operation, telling at each step what he should do next. (The instructor watches, avoiding interruption unless necessary to prevent serious consequences, but makes mental notes to discuss later.)
4. The trainee practices, at first with close supervision, and later with less and less, as he progresses.

PROCUREMENT OF SUPPLIES

Authorized supplies for ship's service activities at the time new construction and Reserve fleet ships are commissioned are included in the Ship's Store Model Stock Plan, prepared by the Navy Resale System Office (NRSO), Brooklyn. Replacements for these supplies as they are used are procured by the supply officer and/or ship's store office. Your part in procurement is to provide information about the items and amounts needed.

Your normal sources of information about supplies and vendors are contract bulletins issued by the Navy Resale System Office.

Consult these bulletins in making up your list of supplies. Vendors listed in the bulletins usually are located close at hand, making purchasing and delivery convenient.

Procure and use standard stock laundry supplies listed in Appendix I. Standard stock items listed in Appendix I are less expensive than commercial items and their use will result in savings that will increase your ship's Welfare and Recreation fund.

Refer to NAVSUP Publication 487 (*Ship's Store Afloat*) for any additional information.

COMPUTING REQUIREMENTS

In computing supply requirements before departure from home port, personnel in the supply office must take into consideration the following: (1) supplies in storage; (2) time period which supplies are to be stocked; (3) endurance of each item; (4) source from which each item is to be procured; (5) lead time (delivery); and (6) availability of supplies enroute. Your estimates will be more helpful to the supply office if you understand these factors and keep them in mind in making your own calculations. The following explanation of each item will assist you in providing the information the supply officer needs.

Item (1), supplies in storage, is determined from inventories and stock records.

The ship's destination and length of the cruise will determine item (2), time for which supplies are to be stocked.

The general rule is that, on departure, supplies should be sufficient to last at least 90 days. An important exception to this rule applies to low cube, low weight, and low cost items (deployed load items). These usually are not carried by forward support activities but should be loaded in quantities sufficient to support the ship for the duration of the cruise.

Item (3), endurance, is the length of time it will take you to use a capacity load of the item.

The procurement source, item (4), is important because not all supplies are available from sources in the ship's home port. If it is necessary to procure them from a distant city, it will take longer to get them. If time is insufficient for normal requisitioning and delivery, it may be necessary to initiate the request by telephone or to make special arrangements for delivery. Keep in mind that the supply office is procuring supplies for the entire ship and that supply personnel will appreciate your saving them these special jobs, if possible, by making your needs known early.

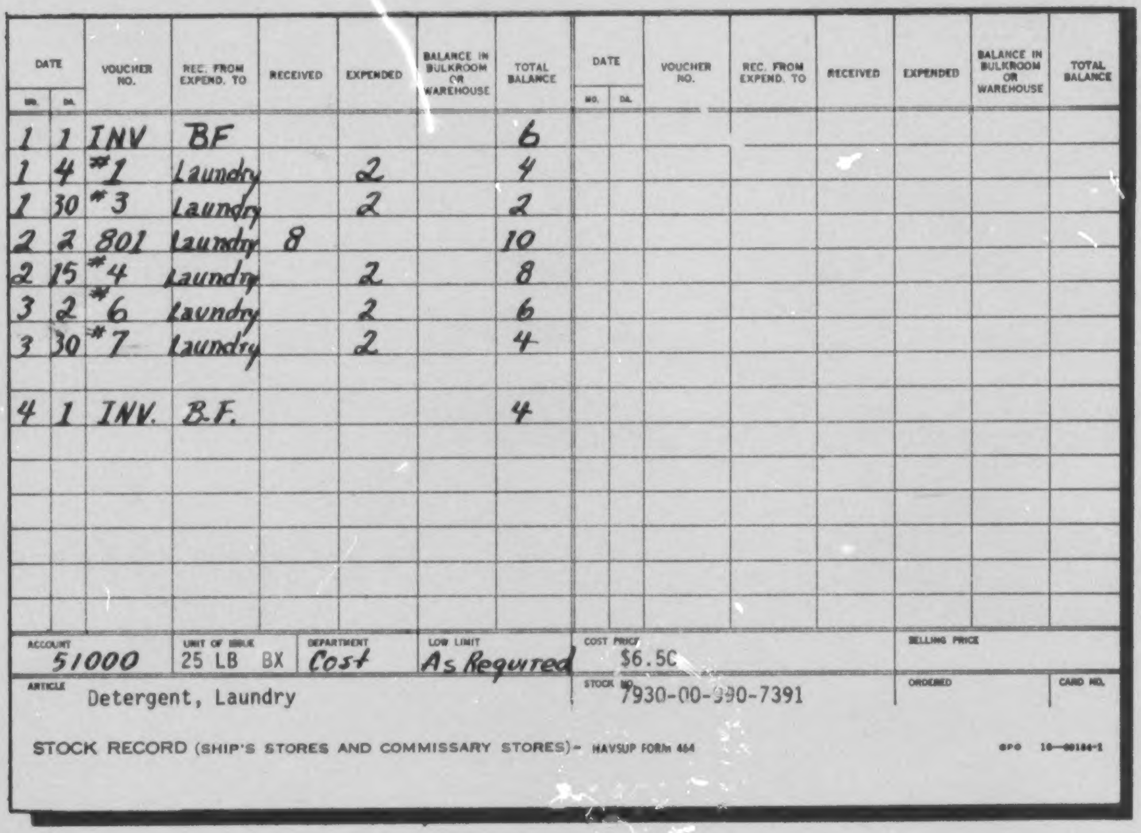
Lead time, item (5), is the length of time it takes to get the item aboard after it is requisitioned. For you it determines how low you can allow your stock of an item to become before you put in a request for replacements. Never wait until you are out, or nearly out, of an item before requisitioning more. Always be sure you have enough to carry you through the lead time, plus a little more to allow for emergencies.

Do not rely on laundry and dry-cleaning supplies being available from enroute sources, item (6), order and have the supplies aboard. An emergency might arise, however, that would necessitate procuring supplies from other than the usual sources.

ESTIMATING YOUR NEEDS

To estimate supplies needed, you require two sets of facts—(1) the amount of each item on hand and (2) the rate of use. Both types of information are available from the Stock Record Cards (NAVSUP Form 464) on file in the supply office. For example, figure 1-1 is a Stock Record Card for laundry detergent covering a 3-months' period. The card shows that 6 drums of detergent were on hand on 1 January and that 10 drums were issued to the laundry between that date and 1 April. It also shows receipt of 8 drums during the period. So the amount on hand as of 1 April is 4 drums, and the rate of use is 10 drums for the 90-day period. According to this rate, you will need 6 more drums to bring your stock up to a 90-day supply.

Be sure, however, that this rate is typical. Usage data are usually established by taking figures for a 6-months' period. Consider the destination of your ship and the type of assignment, and adjust your estimate



DATE		VOUCHER NO.	REC. FROM EXPEND. TO	RECEIVED	EXPENDED	BALANCE IN BULKROOM OR WAREHOUSE	TOTAL BALANCE	DATE		VOUCHER NO.	REC. FROM EXPEND. TO	RECEIVED	EXPENDED	BALANCE IN BULKROOM OR WAREHOUSE	TOTAL BALANCE
MO.	DA.							MO.	DA.						
1	1	INV	BF				6								
1	4	#1	Laundry		2		4								
1	30	#3	Laundry		2		2								
2	2	801	Laundry	8			10								
2	15	#4	Laundry		2		8								
3	2	#6	Laundry		2		6								
3	30	#7	Laundry		2		4								
4	1	INV.	B.F.				4								

ACCOUNT 51000

UNIT OF ISSUE 25 LB BX

DEPARTMENT Cost

LOW LIMIT As Required

COST PRICE $6.50

SELLING PRICE

ARTICLE Detergent, Laundry

STOCK NO. 7930-00-990-7391

ORDERED

CARD NO.

STOCK RECORD (SHIP'S STORES AND COMMISSARY STORES)- NAVSUP FORM 464

GPO

43.25

Figure 1-1.—Stock Record Card, NAVSUP Form 464, showing receipt and issue of laundry detergent.

accordingly. If the ship is going into a hot climate, for instance, there will be a good deal more laundry than if the weather is cool. If the ship is going to a port where her personnel will be involved in numerous social functions, this also will affect the volume of your work and the endurance of your supplies. The length of stay in such a port will determine how many white uniforms you will have to wash.

OBTAINING SUPPLIES FROM THE STOREROOM

Before supplies can be issued to a service activity from the ship's bulk storeroom, the appropriate form must be prepared and signed by the responsible persons. The form used and the exact procedure for obtaining supplies from the storeroom differ according to whether or not the ship has a Supply Corps officer assigned as supply officer.

In the discussion that follows, procedures for obtaining supplies for use in the laundry are used as examples.

SHIPS WITH SUPPLY CORPS OFFICERS

If the ship has a Supply Corps officer, the laundry supervisor takes or sends a list of supplies needed to the supply office. This list usually is written on a plain sheet of paper since it is intended only to furnish the information for preparing the form, which is done in the supply office. Figure 1-2 illustrates the Intra-Store Transfer Data, NAVSUP Form 973, covering issues of laundry supplies. The form is prepared in quadruplicate (original and three copies), and when completed, the form is assigned a number from the Number Control (NAVSUP Form 980). The use of this Number Control is required unless the autographic machine multiple copy is used with the three-part preserialized NAVSUP Form 973. The NAVSUP Form 973 must be signed by the accountable officer or designated officer assistant or, if so designated, by the office records keeper.

The office records keeper forwards the original, first copy, and second copy of the NAVSUP Form 973 to the bulk custodian to make the issue and the third copy is given to the receiving laundryman. The Storekeeper in the bulk storeroom indicates on the original, first copy, and the second copy the amounts actually issued. The second copy is retained by the bulk storeroom custodian for his personal records, and the original and first copy are forwarded directly to the supply office. Upon receipt of the items ordered, the receiving laundryman records the quantities received on the third copy of the NAVSUP Form 973; this third copy is signed by the receiving laundryman to acknowledge receipt of the items noted on the NAVSUP Form 973 and then forwards the form to the supply office. After the office records keeper receives the signed original, first copy, and the third copy in the office, the quantities issued are compared with the quantities received. If no discrepancies are noted, the original and first copy of the form are signed by the receiving laundryman and retained in the office. The third copy of the form is returned to the receiving laundryman.

When the service activity and the bulk storeroom are operated by the same person, the NAVSUP Form 973 is not prepared for breakouts from the bulk storeroom to the service activity. At the end of the accounting period, one NAVSUP Form 973 is prepared with data taken from NAVSUP Form 464.

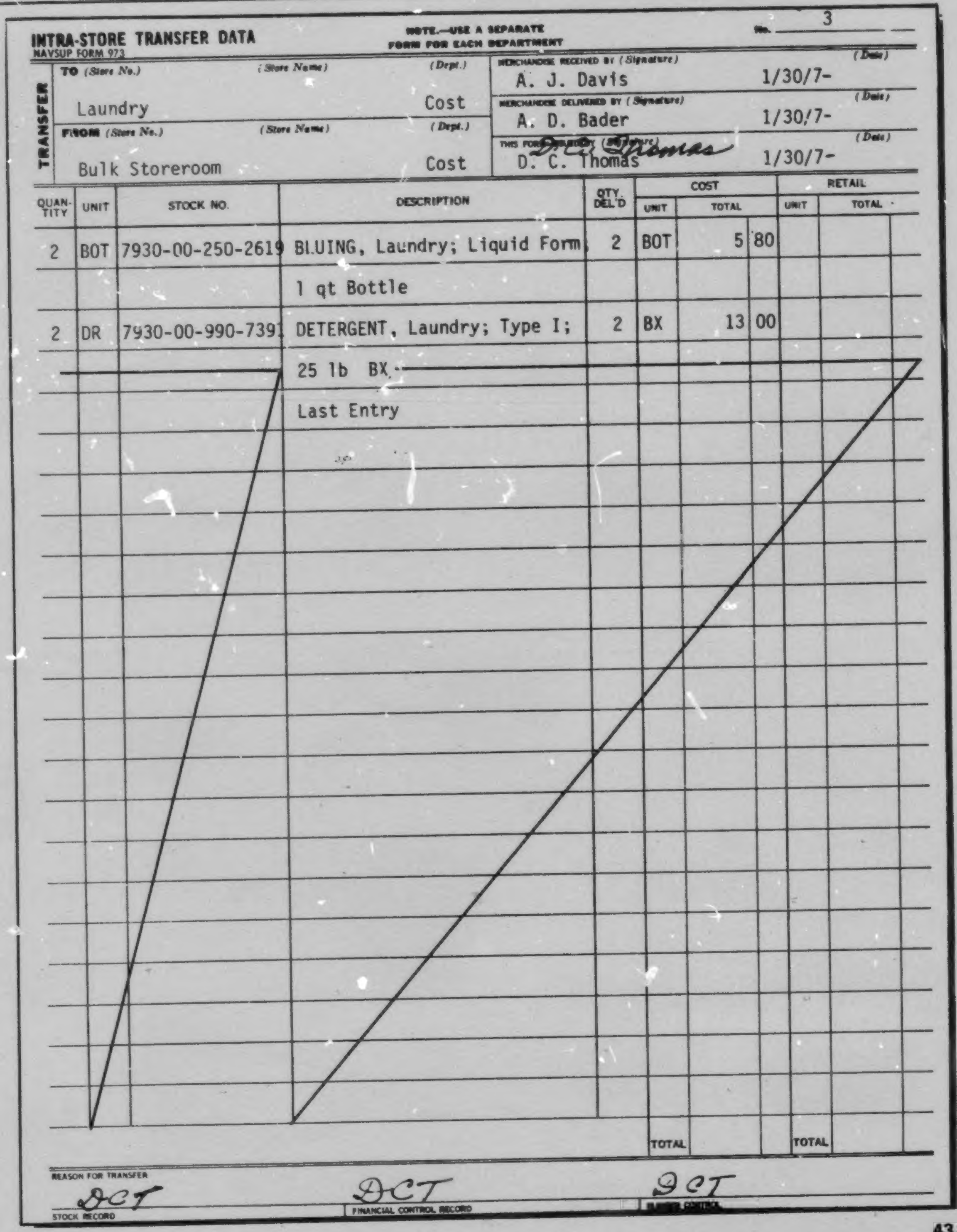
SHIPS WITHOUT SUPPLY CORPS OFFICERS

On board ships without supply corps officers, laundry supplies are funded by the ship's Operating Target (OPTAR).

STORAGE OF SUPPLIES FOR SERVICE ACTIVITIES

Storage space aboard ship usually is limited, so plan before you stow in order to use the space you have as efficiently as possible.

Heavy items used in the laundry should be stowed as near the laundry as possible to prevent unnecessary handling and as a matter of convenience.



INTRA-STORE TRANSFER DATA
NAVSUP FORM 973

NOTE.—USE A SEPARATE FORM FOR EACH DEPARTMENT

No. 3

TRANSFER

TO (Store No.) (Store Name) (Dept.)
Laundry Cost

FROM (Store No.) (Store Name) (Dept.)
Bulk Storeroom Cost

MERCHANDISE RECEIVED BY (Signature) (Date)
A. J. Davis 1/30/7-

MERCHANDISE DELIVERED BY (Signature) (Date)
A. D. Bader 1/30/7-

THIS FORM [illegible] (Signature) (Date)
D. C. Thomas
D. C. Thomas 1/30/7-

QUANTITY	UNIT	STOCK NO.	DESCRIPTION	QTY. DEL'D	COST UNIT	COST TOTAL	RETAIL UNIT	RETAIL TOTAL
2	BOT	7930-00-250-2619	BLUING, Laundry; Liquid Form	2	BOT	5 80		
			1 qt Bottle					
2	DR	7930-00-990-7391	DETERGENT, Laundry; Type I;	2	BX	13 00		
			25 lb BX					
			Last Entry					
					TOTAL		TOTAL	

REASON FOR TRANSFER

DCT
STOCK RECORD

DCT
FINANCIAL CONTROL RECORD

DCT
[illegible]

43.2

Figure 1-2.—Intra-Store Transfer Data form, NAVSUP Form 973, covering issue of laundry supplies.

Bottled items must be protected from breakage. Stow small items in bins or boxes to prevent loss. Such items as net pins, nets, twine, marking tape, and laundry bags should be kept under lock and key.

Rust remover, marking machine cleaning compound, and other similar items are harmful to the skin, and should be stowed in a safe location.

Take special precautions when stowing any form of chemicals that are used for spot and stain removal, or for bleaching. Store such items in COOL, DRY locations.

Protect paper from heat and moisture. Textiles, also, must be protected from heat and moisture and direct contact with steam pipes and similar hot objects. Keep liquids covered to prevent evaporation. The solvent in marking ink, in particular, tends to evaporate when the ink is exposed to the atmosphere. Most chemical compounds and soaps, especially soap powder, absorb moisture when exposed to the atmosphere when the humidity is high.

Gold braid, buttons, cap devices, insignia, and rating badges should be kept wrapped separately in nontarnishing paper, when possible. Do not use a rubber band to hold such items together, as all rubber bands and certain wrapping paper contain sulphur, which tarnishes gilt or gold articles, especially braid and thread.

Leather should be stowed in a cool, dry place and inspected periodically. Leather is subject to mildew, especially in a tropical climate; also, leather may become too dry.

CLEANLINESS AND SANITATION

Cleanliness and sanitation are practiced throughout the Navy, and are particularly necessary in service activities. Adherence to the rules of cleanliness is important not only because regulations require it but for the benefit of personnel working in laundry/drycleaning spaces and to those to whom service is rendered.

Unclean spaces reflect upon your supervisory capabilities, create personnel and fire hazards, and are not tolerated by the medical department.

If your space is clean and orderly, it will be reflected in the quality of your work. This can be accomplished only by training personnel to observe clean personal and working habits.

CHAPTER 2

LAUNDRY ORGANIZATION AND MANAGEMENT

You learned in *Ship's Serviceman 3 & 2* that a supply department afloat has four components: (1) disbursing, (2) food service, (3) stores, and (4) ship's store. The ship's laundry and the drycleaning plant are under the services branch of the ship's store component. They are services provided by the supply department, by direction of the commanding officer, for the benefit of the ship's crew.

LAUNDRY PERSONNEL

Personnel are assigned to the laundry from the ship's serviceman complement. The allowance of rated personnel is based on the assumption that an additional number of non-rated personnel will be required in order to operate the laundry efficiently. These additional men, unless detailed for a specified time (three months or less), are classified as strikers for the ship's serviceman ratings.

The organization of a ship's laundry varies with the size of a ship. A small ship, for example, may have a Ship's Serviceman 2 in charge of the laundry and two Ship's Servicemen 3 assigned as laundrymen. These three men receive, wash, and issue finished laundry. They do everything necessary in the laundry. A large ship, on the other hand, has a much larger laundry organization. A new Navy carrier may have as many as 50 Ship's Service Laundrymen working in the laundry. A guide for determining the number of personnel required to perform the laundry function is one laundryman for every 75 men in the crew.

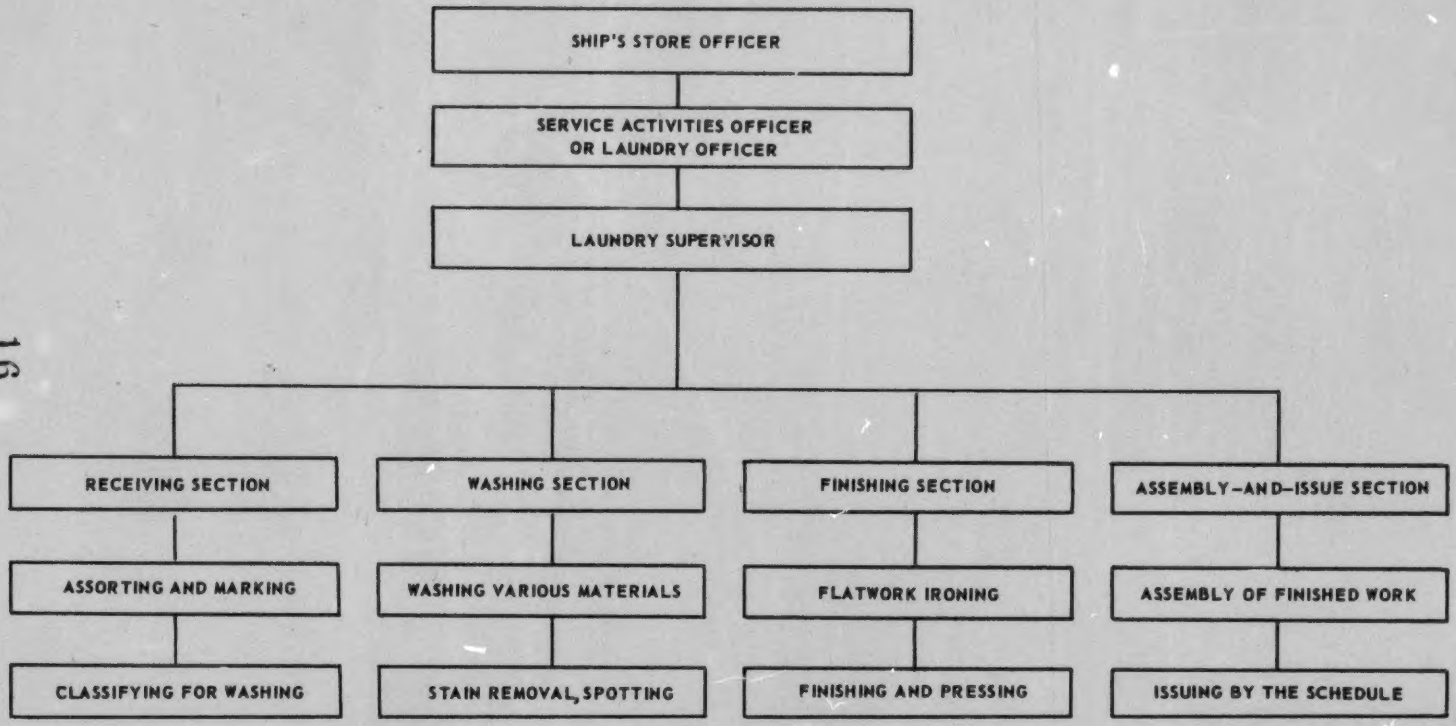
There are more Navy ships with small laundry operations than there are with large laundries, of course; but the purpose of this book is to give you the complete picture of your job in a large or a small laundry, for during your service in the Navy you most likely will have duty in both types.

Figure 2-1 shows the organization of the laundry aboard a large carrier. This is a functional chart showing how the various tasks performed in the laundry are organized and administered. In a large laundry such as this, each section would have its own personnel, although men might be moved from one section to another from time to time to accommodate the workload or to provide training and experience. In a small laundry, all these functions will still have to be performed with fewer personnel and less working space. The result is likely to be a simpler organization chart, with each man performing more kinds of tasks.

Figure 2-2 shows a layout of a laundry on board one of the Navy's new tenders.

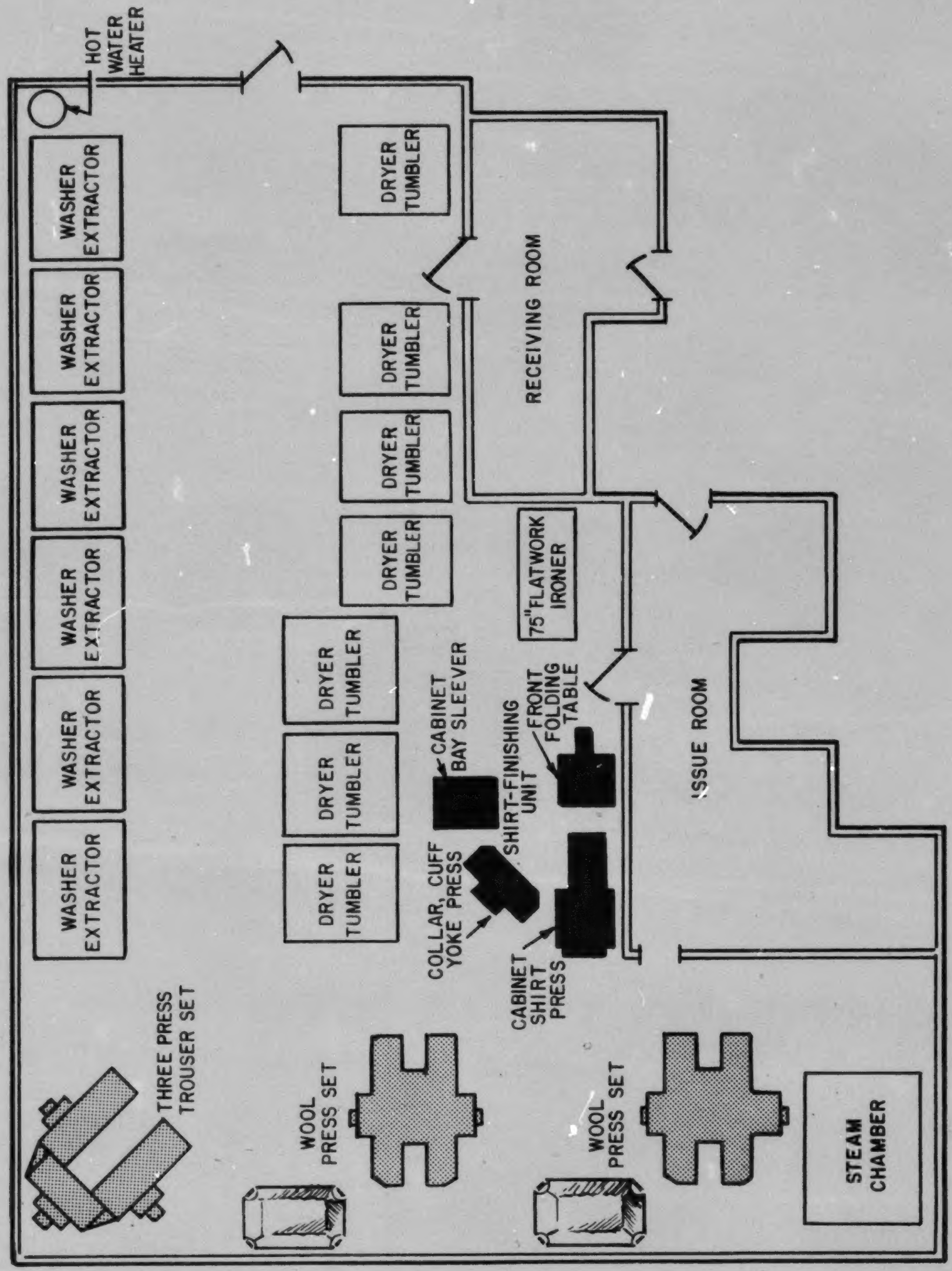
LAUNDRY SUPERVISOR

On a small ship, the Ship's Servicemen in charge of the laundry is responsible to his immediate superior for the complete operation. There may be no experienced laundry officer available to provide guidance. On a large ship, on the other hand, the ship's store officer may operate the laundry under the supervision of the supply officer; or the supply officer may have an assistant supply officer in charge of the services branch who operates the laundry under his direction. In either instance, however, the supervisor of the laundry has a position comparable to that of a civilian manager or a


SHIP'S STORE OFFICER
SERVICE ACTIVITIES OFFICER OR LAUNDRY OFFICER
LAUNDRY SUPERVISOR
RECEIVING SECTION
ASSORTING AND MARKING
CLASSIFYING FOR WASHING
WASHING SECTION
WASHING VARIOUS MATERIALS
STAIN REMOVAL, SPOTTING
FINISHING SECTION
FLATWORK IRONING
FINISHING AND PRESSING
ASSEMBLY–AND–ISSUE SECTION
ASSEMBLY OF FINISHED WORK
ISSUING BY THE SCHEDULE

22.1

Figure 2-1.—Laundry organization chart for a large carrier.


HOT WATER HEATER
WASHER EXTRACTOR
WASHER EXTRACTOR
WASHER EXTRACTOR
WASHER EXTRACTOR
WASHER EXTRACTOR
WASHER EXTRACTOR
DRYER TUMBLER
DRYER TUMBLER
DRYER TUMBLER
DRYER TUMBLER
DRYER TUMBLER
DRYER TUMBLER
DRYER TUMBLER
RECEIVING ROOM
75" FLATWORK IRONER
CABINET BAY SLEEVER
SHIRT-FINISHING UNIT
FRONT FOLDING TABLE
COLLAR, CUFF YOKE PRESS
CABINET SHIRT PRESS
ISSUE ROOM
THREE PRESS TROUSER SET
WOOL PRESS SET
WOOL PRESS SET
STEAM CHAMBER

155.106

Figure 2-2.—Layout of a laundry on board a tender.

Navy shore laundry. His responsibilities are many and varied, in accordance with the size of the laundry he supervises.

The Ship's Serviceman supervising the laundry orders supplies, sees that the laundry is kept clean, and that the equipment is properly maintained, assigns and trains laundry personnel, prepares laundry schedules, ensures an even flow of work through the plant, maintains the standard of quality required on the ship, and does whatever is necessary to make the operation efficient. All of these duties are covered fully in various chapters of this manual.

OTHER LAUNDRY PERSONNEL

All Laundrymen should be able to do well all work in the laundry, so that emergency situations can be met with minimum shifting of personnel. In other words, if part of the laundry crew is absent for some reason, the remaining members should be able to double up and get the laundry work accomplished satisfactorily.

TRAINING LAUNDRY PERSONNEL

There are good laundrymen in the fleet today, not only because of their natural ability and previous experience, but because the Navy has given them good laundry training. A trainee who is only mildly interested often comes to take a real interest in learning about his job and in doing things the right way because of the example and instruction of his supervisor. On the other hand, even the best potential laundry operator can be discouraged from using his ability by careless training. Use of interested personnel whenever possible will help to eliminate the problems noted in the following paragraph.

IMPORTANCE OF TRAINING

Throughout this text, the importance of correct operating procedures is stressed along with the consequences of faulty operations. Repeatedly the following facts emerge:

- Laundry and dry-cleaning equipment will not perform efficiently unless operated correctly, and if operated incorrectly it is easily damaged.
- Replacements are expensive and not always easily available.
- An efficiently operating laundry is vital to the welfare and morale of the ship's company.
- The articles being laundered are valuable and often not easily replaced if damaged or destroyed.
- Faulty or careless operation can easily injure operating personnel.

In the face of these facts, training assumes a position of major importance among the duties of a laundry supervisor. Nothing that he does is more important than making sure that his men know how to handle their machines and supplies correctly and form habits of doing their work so as to protect the machines, the articles laundered or cleaned and their own safety.

The more time you spend on training, the less you will have to spend on troubleshooting and the fewer the mistakes for which you will have to answer. If you expect to meet your schedule and turn out good finished work, it is to your advantage to have your men as well trained as possible.

Training assumes an especially important place among your administrative duties when many of your men are temporarily assigned for a short tour of laundry duty, as is a normal practice on larger ships.

LAUNDRY OPERATION RECORDS

A record keeping system should be maintained for your laundry operation. You will find that records (logs) are the only menas of knowing how your ship's laundry is doing. The actual poundage (or number of pieces) being processed in each area of the laundry must be known before you can assess the efficient or inefficient use of equipment, supplies, and manpower.

The records maintained and the procedures used in the operation of your ship's laundry should be consistent with space, equipment, and personnel. Maintain laundry logs on a daily basis. At the end of each week, summarize all work that was processed in the laundry and forward your report to the supply officer for review. When reviewed by the supply officer, the summary is returned to the sales and service office for filing. Sample laundry production logs are illustrated in figure 2-3.

A laundry equipment maintenance log should be maintained for each piece of equipment and kept up to date in the format shown in figure 2-4. The laundry equipment maintenance log is maintained on a daily basis and all information recorded.

Laundry production and equipment maintenance logs should be made available to inspecting personnel when required.

STEPS IN PROCESSING LAUNDRY

Articles to be laundered are delivered to the ship's laundry either in BULK lots or in INDIVIDUAL BUNDLES. Bulk lots include division laundry (crew's personal clothing), flatwork (both towels and linens from storerooms, officers' and CPO messes, and sickbay), and service laundry (special clothing items of mess management specialists, food servicemen, barbers, hospitalmen, and fountain personnel, such as aprons and work uniforms). Individual lots include officers' and CPO's personal clothing.

Figure 2-5 lists the various steps in processing laundry. The solid black line running from the BULK LOTS block, top left, to the ISSUING block at the bottom shows the steps in processing BULK laundry. The broken line on the right side of the chart connects all types of work accomplished on INDIVIDUAL LOTS.

Marking, classifying, starching, pressing (in most instances), and assembly are additional steps in the processing of individual bundles. Individual lots do not go through flatwork ironing, but officers', chief petty officers', and crews' flatwork is handled in bulk in the flatwork lots.

Division laundry is handled in bulk, as it is brought to the laundry. Flatwork lots include both towels, which are tumbled, and bed and table lines, which are ironed. Service lots are ironed.

LAUNDRY SHIFTS

The laundry workload, combined with the capacity of the laundry equipment and the number and competence of laundry personnel available, determines how many hours per week the ship's laundry must operate. However, in order to divide the workload equitably among the personnel and to establish normal working hours for them, a laundry is generally operated in shifts.

A laundry shift normally lasts eight hours. Your laundry may operate one or two shifts per day or even three if the workload requires.

You must have sufficient experienced personnel to man each shift, so that the work you turn out will be satisfactory. If the number of experienced personnel is not adequate to operate the desired number of shifts, laundry strikers should be assigned to assist them; but do not permit strikers to operate machines on their own until they have been properly instructed. Never try to operate an additional shift unless you have enough qualified personnel to serve as supervisors.

LAUNDRY SCHEDULES

The laundry supervisor prepares the laundry schedule for the approval of his immediate superior. Suppose you are a Ship's Serviceman 2 and must prepare a schedule for your laundry. Some of the factors you will have to consider when preparing the laundry schedule are as follows:

1. Amount of work which must be processed weekly

LAUNDRY BULK WORK LOG

DATE 27 Oct. 1975

DIV/DEPT	NO. OF BAGS	WHITES (WEIGHT)	DUNGAREE (WEIGHT)	OTHER (WEIGHT)	RECEIVED BY: (SIGNATURE LPO)	DELIVERED BY: (SIGNATURE DLPO)	CHECKED OUT BY (SIGNATURE LPO)	RECEIVED BY: (SIGNATURE DLPO)	DATE	REMARKS/COMMENTS
"A"	4		260	40	P.M. Rudowski	J. Darvin	P.M. Rudowski	J. Darvin	2/28	Dungarees Pressed
ENGINEERING	2		110	45	P.M. Rudowski	A. Jones	P.M. Rudowski	A. Jones	2/28	
DECK	3	65	123	55	P.M. Rudowski	B. Barnes	P.M. Rudowski	B. Barnes	2/28	Whites Pressed

Abbreviations:
LPO - Laundry Petty Officer
DLPO - Division Laundry Petty Officer

PRESS DECK LOG (OFFICERS AND CPO)

DATE 28 Oct. 1975

NAME	LAUNDRY MARK	NO. OF SHIRTS	NO. OF TROUSERS	OTHER	WEIGHT	RECEIVED AND CHECKED BY: (SIGNATURE LPO)	DELIVERED BY: (SIGNATURE)	CHECKED OUT BY: (SIGNATURE LPO)	RECEIVED BY: (SIGNATURE)	DATE	REMARKS/COMMENTS
Smith A	S 1234	2	3		4 lbs.	P.M. Rudowski	T. Baker	P.M. Rudowski	T. Baker	10/29	
Barker T.S	G 3259	1	2		3 lbs.	P.M. Rudowski	J. Darvin	P.M. Rudowski	B. Barnes	10/29	

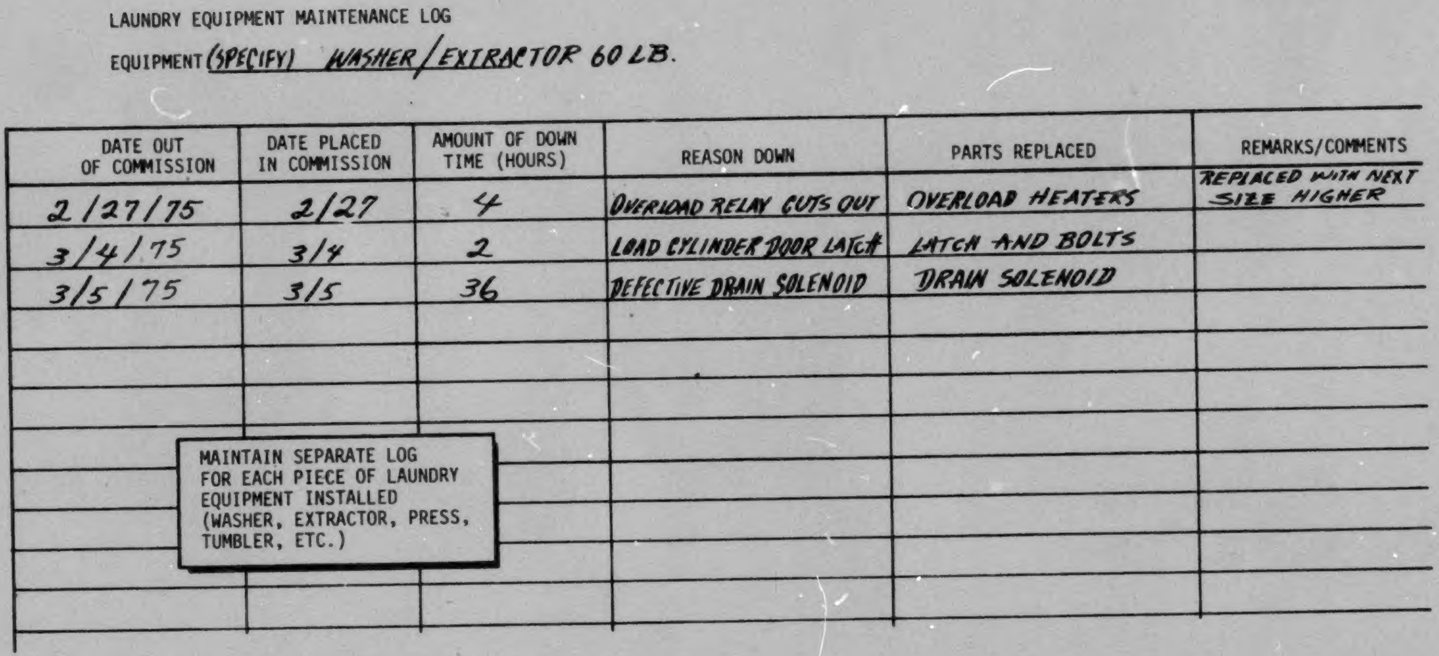
A SEPARATE PRESS DECK LOG SHOULD BE MAINTAINED FOR OTHER PRESS MATERIAL AND SHOULD INCLUDE COLUMNS FOR:

NUMBER OF SHIRTS
NUMBER OF JACKETS
NUMBER OF TROUSERS
NUMBER OF NAPKINS
NUMBER OF TABLECLOTHS
OTHER

Abbreviations:
LPO - Laundry Petty Officer
DLPO - Division Laundry Petty Officer

22.88

Figure 2-3.—Sample laundry production logs.



LAUNDRY EQUIPMENT MAINTENANCE LOG

EQUIPMENT (SPECIFY) WASHER/EXTRACTOR 60 LB.

DATE OUT OF COMMISSION	DATE PLACED IN COMMISSION	AMOUNT OF DOWN TIME (HOURS)	REASON DOWN	PARTS REPLACED	REMARKS/COMMENTS
2/27/75	2/27	4	OVERLOAD RELAY CUTS OUT	OVERLOAD HEATERS	REPLACED WITH NEXT SIZE HIGHER
3/4/75	3/4	2	LOAD CYLINDER DOOR LATCH	LATCH AND BOLTS	
3/5/75	3/5	36	DEFECTIVE DRAIN SOLENOID	DRAIN SOLENOID	

MAINTAIN SEPARATE LOG FOR EACH PIECE OF LAUNDRY EQUIPMENT INSTALLED (WASHER, EXTRACTOR, PRESS, TUMBLER, ETC.)

22.89

Figure 2-4.—Sample laundry equipment maintenance log.

2. Capacity of your laundry equipment
    a. Washers, or washer-extractors
    b. Tumbler dryer
    c. Flatwork ironer
    d. Laundry presses
3. Number and competence of laundry crew

Let us now consider these factors and find out why they have a bearing on your laundry schedule.

AMOUNT OF WORK PROCESSED WEEKLY

Normally, laundry facilities should be adequate to process 18 pounds of laundry per man per week. Of the 18 pounds of laundry to be processed, facilities for finished work should be adequate to handle the press load as noted in the chart below.

To get a rough idea of how much work your laundry may be required to process weekly, get the total number of the ship's crew and multiply the total number by 18 (the average number of pounds of laundry which may be expected to be processed weekly for each member of the crew). For example, if your ship has 3000 officers and enlisted men assigned for duty, your laundry workload for each week can be anticipated to 54,000 pounds (3000 x 18). It can be anticipated that approximately 80 percent of the workload will require tumble drying, approximately two percent will require flat work ironing, and 18 percent will require pressing.

CLOTHING ITEMS TO BE FINISHED PER ACCOMMODATION (SURFACE SHIPS)

ITEMS	NO. OF ITEMS PER WEEK PER ACCOMMODATION							
POLYESTER/COTTON-BLENDS & REMAINING 100% COTTON	NON-AMPHIBIOUS				AMPHIBIOUS			
	OFFICERS	CPO	CREW	GUARD MARINES	TROOP OFFICERS	NCO	TROOPS	
TROUSERS (1)	3	3	3	3	2	2	2	
SHIRTS (1)	3	3	3	3	2	2	2	
FLATWORK	8	8			8	8		
COATS	0.25							

(1) In addition to the quantities indicated in the table, sufficient finishing capacity shall be provided to process two shirts and two trousers per accommodation for 15% of total non-amphibious accommodations.

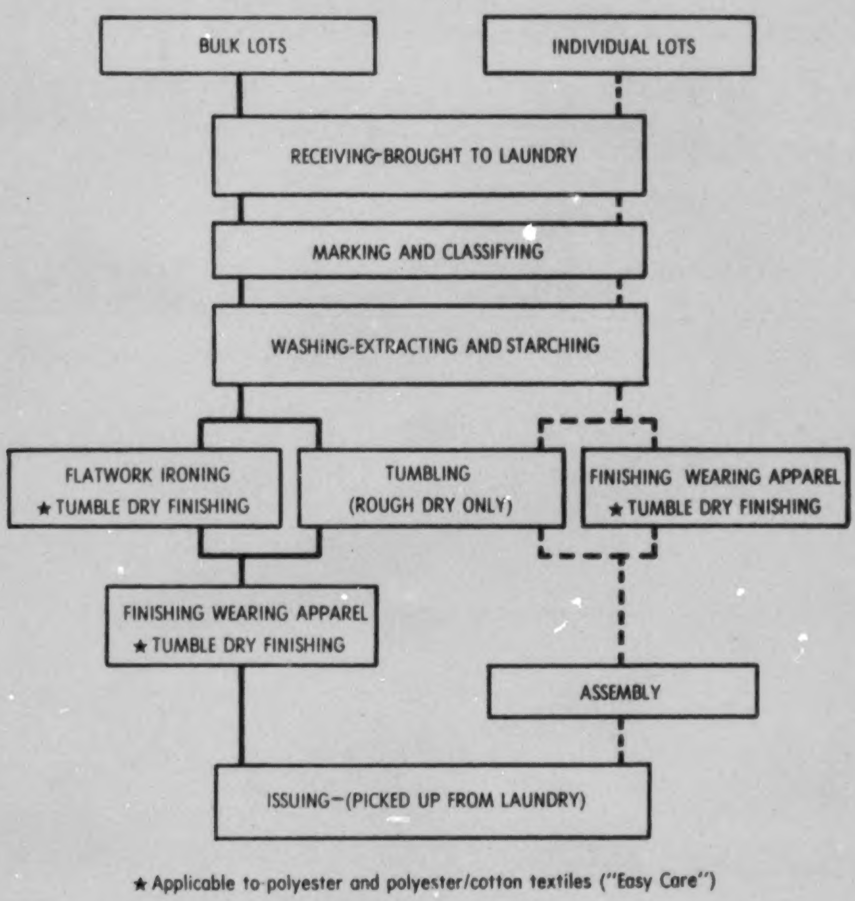

BULK LOTS
INDIVIDUAL LOTS
RECEIVING-BROUGHT TO LAUNDRY
MARKING AND CLASSIFYING
WASHING-EXTRACTING AND STARCHING
FLATWORK IRONING
★ TUMBLE DRY FINISHING
TUMBLING
(ROUGH DRY ONLY)
FINISHING WEARING APPAREL
★ TUMBLE DRY FINISHING
FINISHING WEARING APPAREL
★ TUMBLE DRY FINISHING
ASSEMBLY
ISSUING—(PICKED UP FROM LAUNDRY)
★ Applicable to polyester and polyester/cotton textiles ("Easy Care")
22.3

Figure 2-5.—Flow chart of laundry operations.

CAPACITY OF LAUNDRY EQUIPMENT

The capacity of the equipment determines how much tumbled work can be handled in a day; how much flat work; and how much press work. The capacity of the equipment depends not only on its rated capacity, but also on the efficiency and size of the laundry crew, as you'll learn next. If there are six centers of production, for example, and four men to operate them, 2 units will be idle at any given time.

SIZE AND COMPETENCE OF LAUNDRY CREW

Laundering is one of the shipboard jobs that must be done whether you have sufficient personnel or not. Your problem will usually be primarily one of scheduling so as to make the best use of the personnel available and to spread the workload as fairly as possible. In doing this, keep in mind that all operations should be SUPERVISED by TRAINED personnel, but that these trained men need not PERFORM all tasks.

If your workload is very heavy, a request for additional hands may be granted, but the men you receive will probably be untrained. You will then need to work out a schedule that divides your trained men as effectively as possible to direct the work of the others. This may be accomplished by running two shifts or even two shifts with a cross-shift.

If you have insufficient trained men, you will have to provide training. If this must be done hurriedly to handle an emergency, don't try to teach every task to every trainee. Instruct a few in each task and let them rotate later for more complete training. Operation of a well planned training program is, of course, a responsibility of the laundry supervisor.

BEST TYPE OF LAUNDRY SCHEDULE

The best type of laundry schedule is the one which best fulfills the laundry requirements of your ship. Some ships' laundries have successfully used daily schedules; that is, they arrange to have part of all laundry from divisions delivered to the laundry each day for processing instead of once or twice per week. The problem of stowing soiled bundles–always a troublesome one–is partially eliminated by the daily schedule. The amount of work-in-process is reduced, and better delivery schedules can be developed. Daily scheduling of division laundry also eliminates bad odors in living quarters from soiled clothing, and therefore helps morale. On the other hand, the laundry workload on some ships may not justify a daily schedule–the amount of water and detergents used may be unnecessarily heavy, and equipment run at less than full capacity.

SAMPLE LAUNDRY SCHEDULE

Your laundry schedule should show such things as: (1) type of lot, (2) individuals and groups to whom the lots belong, (3) the men who deliver the lots, (4) day and hour of delivery, and (5) hour of pickup. Study the sample schedule in figure 2-6. A sample set of accompanying instructions showing typical time of pickup, method of delivery, and service rendered is given in figure 2-7. If preparing a set for your ship, you will, of course, modify it according to circumstances. A ship's laundry schedule should be flexible and varied as shipboard conditions require.

INSTRUCTIONS FOR HANDLING INDIVIDUAL BUNDLES

Bundles received daily in the laundry from officers and chief petty officers are considered as one lot of individually marked bundles. If you have more bundles in the daily lots than available assembly bins, it is best to set up two lots daily. You can then assemble and check out the bundles in the first lot before work from the second lot comes to the assembly bins. Twenty bundles in a lot are easy to handle. Never put more than 50 bundles in one lot.

The number of bundles you should put in a lot will be affected by the classification of the items in the bundles. Classification, about which you will learn more in chapter 3, is the separation of a bundle of laundry according to color, type of fabric, and degree of soil; i.e., white cottons, other white or light-colored fabrics, light cottons with heavy stains, dark-colored cottons, and so forth. Items are classified according to the washing formulas to be used.

LAUNDRY LIST FOR INDIVIDUAL BUNDLES

Ship's laundries can use a Ship's Store Laundry List (fig. 2-8) to suit their specific needs. Normally, the form contains blanks at the top for the name of the ship, name of customer, rank or rate, social security number, date, and laundry mark. There is usually space for a CUSTOMER'S-COUNT column and a PLANT-COUNT column, aligned with the list of articles.

The patron fills in the lines at the top of the laundry list, and enters the number of each

Lot	Individuals or Organization	Delivered by	Delivery	Hour of pickup
INDIVIDUAL	Officers	*	Mon.-Tues.-Wed.	(1000)
	Chief Petty Officers	Ind. CPOs	Th.-Fri.-Sat.	(1000)
		Individuals	Th.-Fri.-Sat.	(1000)
DIVISION (Bulk)	No. 1	Laundry POs	Monday	0800
	No. 2	do	do	1130
	No. 3	do	do	1600
	No. F	do	Tuesday	0800
	No. H	do	do	1130
	No. V	do	do	1600
	No. 4	do	Wednesday	0800
	No. 5	do	do	1130
	No. 6	do	do	1600
	No. A	do	Thursday	0800
	No. C	do	do	1130
	No. E	do	do	1600
	No. G	do	Friday	0800
	No. L	do	do	1130
	No. M	do	do	1600
	No. S	do	do	1600
	No. R	do	Saturday	0800
	No. B	do	do	1130
	No. N	do	do	1600
FLATWORK (Bulk)	Wardroom	*	Monday	1100
	Staterooms	*do	Wednesday	1000
	CPO Mess	*do	Friday	1000
	Sick Bay	Hospitalmen	Tu.-Th.-Sat.	1000
SERVICE (Bulk)	Mess Management Specialists	One of same	Daily	0900
	Barbers	do	do	1100
	Fountain Men	do	do	1300
	Hospitalmen	do	do	1500

*Personnel assigned to the rotatable pool.

22.64

Figure 2-6.—Sample laundry schedule.

TIME SCHEDULES

Time schedules for the laundry operation are as follows:

1. INDIVIDUAL WORK will be picked up from the laundry at 1500 on the day following delivery.
2. DIVISION LOTS presented at the laundry at 0800 will be picked up at 1300 on the day of delivery, lots presented at 1130 will be picked up at 1630 the day of delivery, and lots presented at 1600 will be picked up at 1030 the following day.
3. FLATWORK lots will be picked up at 1530 the day of delivery.
4. SERVICE LOTS presented at 0900 will be picked up at 1430 on the day of delivery, lots presented at 1100 will be picked up at 1600 on the day of delivery, lots presented at 1300 will be picked up at 0900 the following day, and lots presented at 1500 will be picked up at 1030 the following day.
5. Late deliveries to the laundry will be processed at the convenience of the laundry and not under the schedule indicated.

SERVICE RENDERED

Services rendered will be as follows:

1. INDIVIDUAL LOTS will be tumbled, except shirts and uniforms, which will be starched and pressed. Undershirts and handkerchiefs will be passed through the flatwork ironer, or tumbled.
2. DIVISION LOTS will be tumbled except shirts and uniforms which will be pressed as schedule permits.
3. FLATWORK LOTS will include bath towels and flatwork. The towels will be tumbled; and flatwork, such as bed and table linens, will be ironed or pressed when possible.
4. SERVICE LOTS will be ironed on the presses or tumbled, as equipment permits. Work uniforms will be the only personal apparel included in these lots.
5. At the discretion of the laundry, if tumbler production is behind, work to be tumbled will sometimes be run through the flatwork ironer or pressed.

METHOD OF DELIVERY

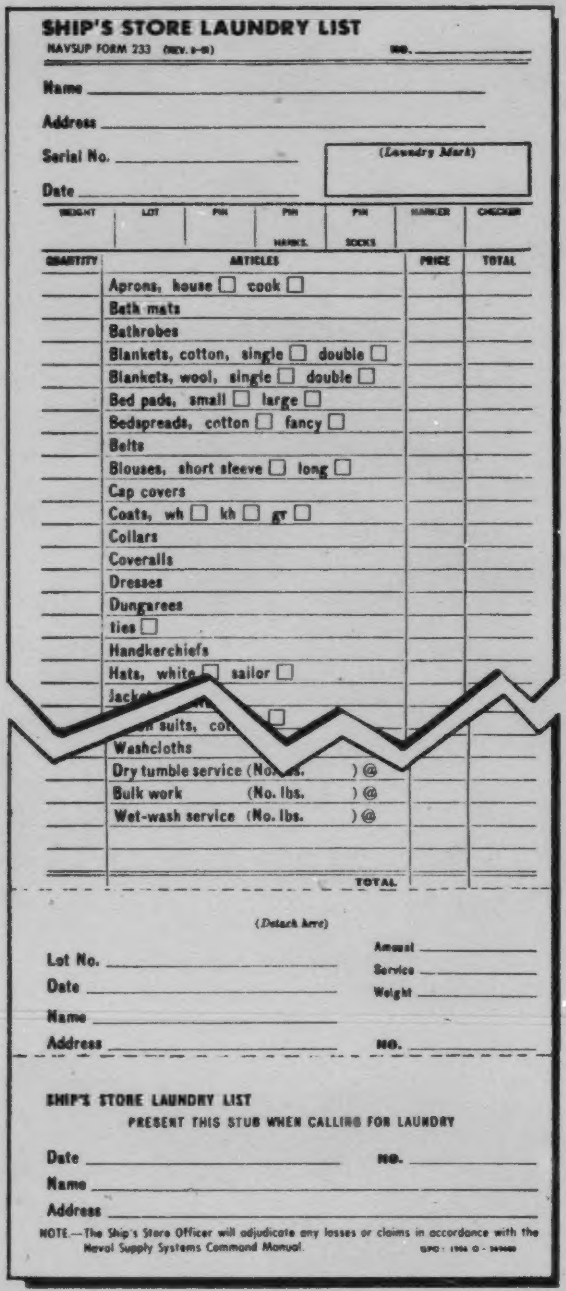
The method of delivery to the laundry will be as indicated below:

1. OFFICERS' AND CHIEF PETTY OFFICERS' bundles will be processed daily in accordance with the schedules posted in the wardroom and C.P.O. quarters. A laundry list will accompany each bundle. The customer's count should be entered in the proper column.
2. EACH DIVISION will deliver its work in two groups, one containing all white work and one with dungarees and black socks. All division articles will be properly stenciled before delivery to the laundry. Items to be pressed will be placed in a separate division bag.
3. FLATWORK will be delivered in bulk for each source listed under flatwork lots (fig. 2-6).
4. EACH SERVICE ACTIVITY will deliver its laundry in bulk.

22.65

Figure 2-7.—Sample laundry instructions.

article in the appropriate block. He puts the laundry list with his laundry, and turns it over to the laundry receiving clerk.



SHIP'S STORE LAUNDRY LIST
NAVSUP FORM 233 (REV. 8-81) NO. ____

Name ____
Address ____
Serial No. ____
Date ____

(Laundry Mark)

WEIGHT	LOT	PIN	PIN HANKS.	PIN SOCKS	MARKER	CHECKER

QUANTITY	ARTICLES	PRICE	TOTAL
	Aprons, house ☐ cook ☐		
	Bath mats		
	Bathrobes		
	Blankets, cotton, single ☐ double ☐		
	Blankets, wool, single ☐ double ☐		
	Bed pads, small ☐ large ☐		
	Bedspreads, cotton ☐ fancy ☐		
	Belts		
	Blouses, short sleeve ☐ long ☐		
	Cap covers		
	Coats, wh ☐ kh ☐ gr ☐		
	Collars		
	Coveralls		
	Dresses		
	Dungarees		
	ties ☐		
	Handkerchiefs		
	Hats, white ☐ sailor ☐		
	Jack		
	suits, co ☐		
	Washcloths		
	Dry tumble service (No. lbs.) @		
	Bulk work (No. lbs.) @		
	Wet-wash service (No. lbs.) @		
	TOTAL		

(Detach here)

Lot No. ____ Amount ____
Date ____ Service ____
Weight ____
Name ____
Address ____ NO. ____

SHIP'S STORE LAUNDRY LIST
PRESENT THIS STUB WHEN CALLING FOR LAUNDRY

Date ____ NO. ____
Name ____
Address ____

NOTE.—The Ship's Store Officer will adjudicate any losses or claims in accordance with the Naval Supply Systems Command Manual.
GPO : 1984 O - 369680

22.4

Figure 2-8.—Ship's Store Laundry List.

HANDLING BULK LOTS

Each enlisted man is responsible for stenciling his own clothing. The laundry petty officer in each division should accept only properly stenciled clothing. Both black and white stencil inks usually are available in the ship's store.

Proper stenciling of clothing ensures its proper distribution from the laundry. Stenciling can be accomplished easily with a small, hard-bristle brush.

LAUNDRY CONTROL LIST FOR THE CREW

If the laundry petty officer wants a control of the items turned in by and returned to each man, he can list all articles sent across the top of a sheet of paper and write the men's names in a column down the left side of the sheet. He should then enter the number of each article sent by each man in the box opposite the name and below the article. When the articles are returned to an individual he should check them off the list. If all articles are properly stenciled before they are sent to the laundry, this type of control will generally be unnecessary.

IDENTIFICATION WITHIN THE LAUNDRY

Your problems of identification are confined to: (1) bulk lots, (division or organization) and (2) items in individual bundles (officers' and CPOs'). Each of these is considered separately in the following pages.

You need a good system in the ship's laundry for identifying and controlling all articles brought to you for processing. In figure

Figure 2-9.—Laundrymen at work in receiving room.

22.5

2-9 a laundryman has checked in some laundry and is seen marking the laundry with the marking machine.

IDENTIFICATION OF BULK LOTS

You do not have to identify individual items in bulk lots brought to the laundry, but you do need to put some type of marker with each lot, so that you can identify it during any phase of processing. You can make your own markers, or flags, from a duck fabric, cut about 8 to 12 inches square and hemmed. Then stencil one marker for each division, service group, or any activity which brings bulk work to you. When bulk lots are brought to the laundry, put the proper identification markers on them. You can use the same markers week after week. Inexpensive squares of washable paper, or fiber in colors, are available from laundry supply houses and are an accepted means of identification.

In the event you are required to split a lot, put the right markers on every part of it. All markers remain with lots and portions of lots during the complete washing and processing cycle. Put the marker in the washer with the load, and identify the load on the shell of the washer with chalk. If it is necessary that you put more than one lot in the washer, to get full capacity, use a proper size laundry net for the smallest lot. When more than one net is required for the same lot, use a marker for each net.

USE OF LAUNDRY NETS

Laundry nets are frequently used for identifying items either in bulk lots or individual bundles. They are open-mesh bags made from cotton or nylon in which the clothes are placed for washing. Nylon nets have generally replaced cotton nets. They resist chemicals better than cotton and thus last longer. They also increase the payload.

You can do effective washing with laundry nets, provided you do not overload them. You must give the water and soap a chance to get at the clothes in order to remove soil. Check the maximum loads recommended for laundry nets below.

Nets are especially useful for separating small items, such as handkerchiefs or socks from the larger articles. There are two general types of nylon nets–woven and knitted. Woven nets do not stretch and thus retain their size; knitted nets have a tendency to stretch and increase in size. For this reason, their capacities are given within a range, as follows:

Size in Inches	Capacity in Pounds
9 x 15 or 10 x 15	2-4
24 x 36	8-12

IDENTIFICATION OF ITEMS IN BUNDLES

The procedure for identifying items in individual bundles described in detail herein has been used successfully in shipboard operation. You may be able to modify this procedure to fit your own needs. The steps in the procedure are as follows:

1. Work on ONLY ONE individual bundle at a time; this prevents mixing of items from several bundles.

2. Remove the laundry list from the bundle and determine from the individual's name and social security number what the laundry mark will be. This mark is made from the first letter of the individual's surname and the last four numbers (figures) of his social security number. For example, the laundry mark for SKC Michael J. Fedorko, 217-60-7565, would be F-7565. This is the standard type of laundry mark used throughout the Navy.

3. Set the individual's laundry mark on the marking machine and stamp it across the face of his laundry list. Check the mark for accuracy. This list now denotes ownership of laundry in the bundle.

4. Count every article in the laundry bundle and enter the number in the correct block on his laundry list. If your count does not agree with that of the customer, request the senior laundryman to recheck it. When the senior laundryman's count is in disagreement with that of the customer, he should enter the correct count on the laundry list, circle the customer's count, then initial the circle and notify the customer of the change through whoever brought in the laundry bundle.

5. Check each article for a correct legible mark. If there is no mark, put ONE ONLY in the proper place (explained later). Do NOT mark such items as bath towels, wet articles, or dark-colored fabrics. Use pronged marking tags on these items. These tags are narrow strips of cloth approximately 1 inch long with metal fasteners in the ends. Push the metal fasteners through the material and press them flat on the other side. Enter the correct identification on the tags.

6. Check the inside of all pockets for any articles, such as pens, pencils, lighters, combs, etc. If any items are found in the pockets, a notation should be made on the NAVSUP Form 233, Ships Store Laundry List, and also in the laundry log book so these items can be returned to the owner.

7. Check all articles of clothing for any tears, stains, missing buttons, etc. Any items found to be damaged should be noted on the reverse side of the laundry list and also in the remarks column of the Laundry Log Book.

8. When finished with one bundle, clear the laundry marking machine by setting all type to the neutral position. You are then ready to start on another bundle.

Location of the Laundry Mark

There is a standard spot for the laundry mark on each article. If the mark is correctly placed in this location, the receiving clerk can check items in easily and quickly. He can also check and assemble finished articles without unfolding them. The locations of laundry marks are as follows:

- DRAWERS.–On the inside of the waist band, left of center of the label.

- HANDKERCHIEFS.–Do NOT mark. Put them in a net and identify with a marked strip tag, placed on the inside or pinned on the outside. Some handkerchiefs are made of fine linen and are expensive. A mark would be ugly if used on such articles and exposed to view.

- SHIRT.–On the inside neckband of shirts, at the center, well below the fold of the collar.

- TROPICAL SHORTS.–On the inside waist band of shorts, right side, in line with the outside leg seam.

- SOCKS.–Socks are not marked; instead, marks should be put on a piece of sheeting and then placed inside a standard 10" x 15"' laundry net used for washing the socks. The socks should be untied and loose in the net. A separate net should be used for each individual.

- UNDERSHIRTS.–On the inside, one inch to the left of the label.

LAUNDRY MARKING MACHINES

Navy ships' laundries at the present time use two kinds of laundry marking machines: (1) those which use ink, and (2) those which use ribbons. Both types are discussed in this chapter.

INK-TYPE LAUNDRY MARKING MACHINES

One ink-type laundry marking machine currently used in ships' laundries is the National Model 15, illustrated in figure 2-10. This machine prints six or more characters and is operated by type keys. As indicated in the figure, it has eight rows of type keys which set the type wheels to the desired mark.

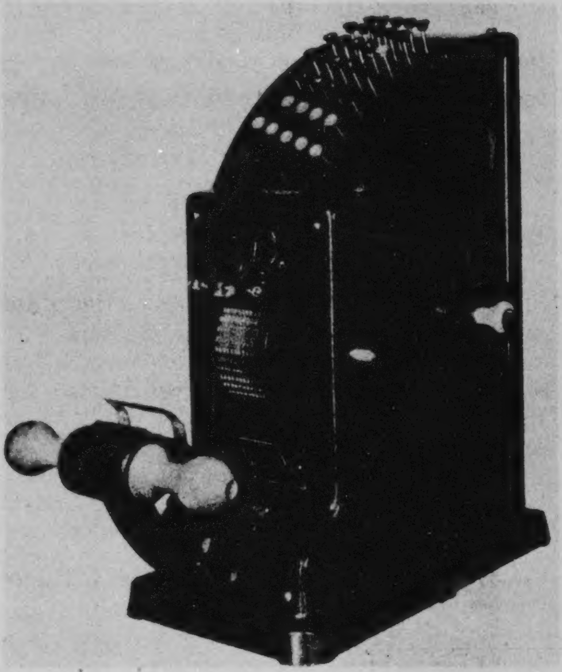


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Figure 2-10.–National Model 15, ink-type laundry marking machine.

A second type of ink laundry marking machine still used in ships' laundries is the LEVER-PRINCIPLE marking machine. It has levers on the top-front of the machine for setting the type wheels to the desired mark. This is also a National marking machine. It prints six or more characters. This machine uses the same principle of operation as the Ribbonrite machine illustrated in figure 2-11, except that the Ribbonrite uses a ribbon instead of ink.

Setting and Clearing

To set the National Model 15 marking machine, press down and hold with one finger of the right hand the desired type key. With the left hand, push the type setting lever on the left side of the machine until it stops. First release the lever, and then the key. Continue in this manner until you have set up the laundry mark in full. You are then ready to mark items. To clear the machine, push the return lever at the right side as far as it will go.

The procedure for setting a lever-type laundry marking machine is as follows:

1. Start at the left of the machine and move the indicator lever to the first letter of the mark (on front top of machine).
2. Move the second lever to the dash (–), used between the first letter of the surname and the first number of the social security number used in the mark.
3. Continue with the 3rd, 4th, 5th, and 6th levers to set up the last 4 numbers of the service number.

Clear this machine by moving the indicator levers to the BLANK position.

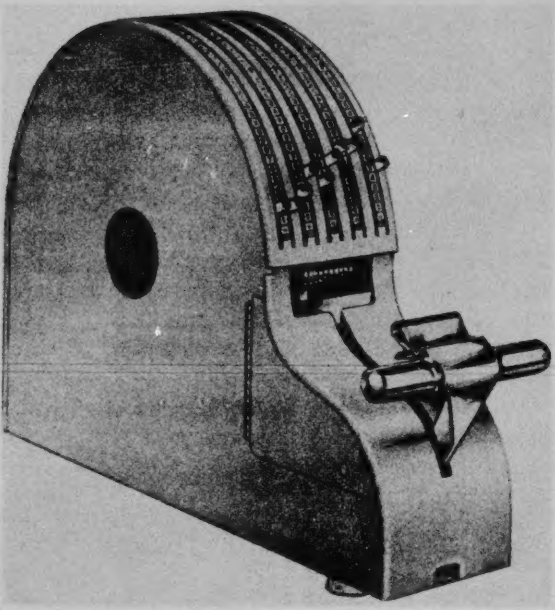

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Figure 2-11.—Ribbonrite laundry marking machine.

Marking

The procedure for marking laundry is the same for MOST types of marking machines.

1. Put the item to be marked underneath the tension plate and over the platen. The tension plate holds the item in place, so that the laundry mark can be placed exactly where you want it.

2. Raise the printing lever forward with both hands to bring the item to be marked in contact with the type. For best results, use a steady push on the lever.

3. Check the mark for clarity. If it is not clear, bring the lever up a second time. If the mark is not satisfactory now, the machine needs inking.

How to Ink a Laundry Marking Machine

To ink a laundry marking machine, proceed as follows:

1. Press the printing lever slightly toward the marking machine.

2. Lift up on the end pins of the tie bar of the inking arms and remove the ink pad holder. Do NOT remove the sponge rubber on which it rests.

3. With an ink dropper, completely saturate the center of the pad with ink. There should be no white spots left on the pad, but do not use TOO MUCH ink. If you do, remove it from the sides with a blotter.

4. Put the ink pad holder back in position on the inking arm.

5. To ink the upper (contact) pad, press the printing lever toward the machine and contact the type with the lower pad.

6. Raise the upper pad holder and saturate the center of the pad with the ink dropper.

7. Lower the upper pad holder to its normal position.

For the most satisfactory operation, change the ink pad of the marking machine frequently.

The lower pad does not require re-inking as often as the upper pad.

Laundry Marking Inks.–There are several types of marking inks, but the type you use in the laundry is for marking cloth only. It is a fast-drying ink which can be used either for hand marking with a pen or on the ink pad of the marking machine.

Stenciling ink is also fast drying, but it cannot be used on a marking machine. It should be used with a stencil. Apply it with a brush or any other suitable applicator.

Indelible ink has been tried for marking clothes. It is unsatisfactory, however, because it is too thin and dries too slowly.

RIBBON-TYPE LAUNDRY MARKING MACHINES

A laundry marking machine which uses a ribbon instead of ink eliminates the probability of getting ink on clothes while you are marking, or of spilling the ink while you are handling it for re-inking. Some ships' laundries are currently using the Ribbonrite marking machine, illustrated in figure 2-11. This is the 590-6 model.

The Ribbonrite machine uses the LEVER-PRINCIPLE for setting the mark. The levers are attached directly to the type wheels, each of which contains all numerals and the complete alphabet.

Operating Ribbon-Type Machines

Some things to remember when you are operating a Ribbonrite marking machine are:

1. To prevent wrinkling of the ribbon, keep the printer arm down when you set the type handles.

2. Use both hands to operate the machine. Use a complete stroke and make quick, sharp contact with the article being marked:

3. Unfold shirt collars before you mark them.

CARE AND MAINTENANCE OF LAUNDRY MARKING MACHINES

A certain amount of care and maintenance must be given to laundry marking machines to keep them in good working order and to extend their usefulness.

HOW TO CLEAN INK-TYPE LAUNDRY MARKING MACHINES

The recommended procedure for cleaning a laundry marking machine is given by steps. Type wheels, in particular, must be kept clean.

1. Brush ink from the type several times a day before it hardens. The manufacturer of the machine provides a type-cleaning brush.

2. Remove the type wheels once a week and soak them overnight in a special cleaning compound. Proceed as follows:

a. Remove the inking arm tie bar.

b. Remove the four screws which hold the front plate and then take it off the machine.

c. Use the return lever on the right side of the machine to set all type wheels on BLANK

d. Loosen the screw on the left side of the machine which holds the type wheel shaft in position. Hold the type in the left hand and use the right hand on the nickel-plated knob on the right side of the machine to pull out the type wheel shaft.

e. Leave all type wheels in the drum. Secure them in the drum with a long string.

f. Put the type wheels and the drum in the cleaning solution for an overnight soaking. Let the string hang over the side of the container which holds the cleaning solution, so that you do not have to put your hands into the solution to remove the type wheels.

g. The next morning, take hold of the end of the string wrapped around the type wheels and remove them from the cleaning solution.

h. Put the set of type, and the drum, under a hot water spigot to remove the dissolved lint and ink from the type wheels. The water pressure should be strong.

i. If after this procedure any ink or dirt remains on the type wheels, use the brush to finish the cleaning.

j. Put the type wheels back into the machine in the same manner as you took them out, in reverse order.

CLEANING THE RIBBONRITE MARKING MACHINE

Keep all parts of the marking machine clean, type faces in particular. Proceed as follows:

1. Bring the type levers to the full FORWARD position.

2. Depress the clip on the back of the cover (bottom) and unlock it in front.

3. Raise the index handles to bring the type into the most accessible position and clean it with the wire brush provided by the manufacturer for this purpose.

4. Another way to clean the type assembly is to remove the assembly by first removing the pin inserted through the shaft channels over the shaft and disengaging the spring lock. After the assembly is removed, clean it with a steam gun.

LUBRICATION OF MARKING MACHINES

Type wheels of laundry marking machines must be oiled regularly. If they work hard or screech, they need oil. Care must be exercised in oiling, however, to prevent oil from getting on the type and ink pad. The oil will wash out marks made by the type.

Two things are important in oiling the type wheels: (1) the position of the wheels at the time of oiling, and (2) the instrument used to put the oil in the proper place. There is a little V-shaped groove on each side of the opening in the front cover plate of the machine through which the type wheels come out when you are using the machine. When the wheels are in proper position for oiling, this V-shaped groove lines up with another V-shaped groove in the type wheel drum.

Do not squirt oil on the wheels, or down between them. Use a pipe cleaner in this manner:

1. Put a few drops of oil on the pipe cleaner and place it in the groove, full length.

2. Next move the type setting lever, so that each type wheel will revolve over the pipe cleaner. This procedure lubricates the type wheels at the point where they rub on the drum.

There is a pin on the side of the type wheel drum which fits into a recess on the front cover of the machine. Its purpose is to keep the drum from rotating in the machine, and it also keeps the oil groove in the type drum in the right position for oiling. Be sure this pin is always in the recess provided for it.

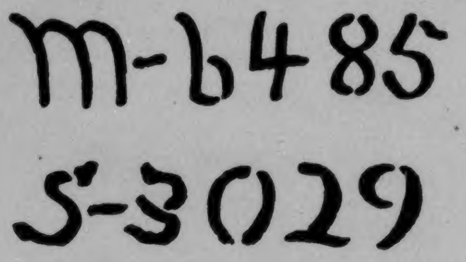
REPLACING PARTS

When parts of the machine become worn, they should be replaced with new ones. Keep a supply of the most used repair parts on hand. A manufacturer's instruction manual is furnished for each laundry marking machine. The mechanic who works on the machine should also have a copy of this instruction book. Do not try to replace a broken type wheel, or do any mechanical work on the machine, unless it is absolutely necessary. Always request that the work be accomplished by a trained man from the engineering department.

PEN MARKING

An ordinary penholder may be used to hold the marking pen. The marking penpoint is turned up on the end. The point is flat and is at an angle with the length of the point. There is no hole in the slit of a marking pen.

In marking with a pen, wrap the material around the first two fingers and hold the



22.8

Figure 2-12.—Pen marking.

material with the thumb and third finger, or place the material on a table or any smooth surface and hold the material tight with the fingers.

Dip the pen in the marking ink and get enough ink to mark six or seven letters, no more. If there is an excessive amount of ink on the pen it will cause smears.

Hold the penholder between the thumb and the index finger, almost at a right angle with the material. Then pull downward, toward the palm of the hand, with the penpoint in contact with

NAVY SHIPBOARD LAUNDRY FIRES

(1 January 1969 — 10 October 1971)

SITE	$ LOSS	LOCATION	ELAPSED TIME, HRS	HEAT SOURCE	TYPE OF CLOTHING	COOLED DOWN	STATED CAUSE OF FIRE
DE	670	Dryer	------	------	------	------	Clothes left in dryer
LPD	150K	Dryer	1	Off	Officers	------	Clothes left in dryer
AOE	------	Hamper	------	------	Whites	------	Skipped laundry cycles
DLGN	157	Dryer	------	Off	------	------	Clothes left in dryer
DLG	150	Dryer	1-3/4	Off	------	------	Clothes left in dryer
LPH	100	Dryer	------	------	------	No	Clothes left in dryer
DD	150	Dryer	2	On	------	------	Clothes left in dryer
LKA	219	Dryer	2-3/4	Off	------	------	Clothes left in dryer
AFS	70	Dryer	------	------	------	No	Clothes left in dryer
ARVH	------	Table	------	------	Linens	------	Cigarette sparks
DLGN	------	Dryer	3-1/4	On	------	------	Clothes left in dryer
DD	------	Dryer	1-1/2	Off	Towels, Linens	------	Clothes left in dryer
CVA	4K	Dryer	------	On	------	------	Clothes left in dryer
LPA	105	Dryer	1/2	Off	------	No	Clothes left in dryer

Figure 2-13.—A listing of Navy shipboard laundry fires.

the material. Make straight lines with a slight back-hand slant. Use as many downward strokes as necessary to complete a letter or number. See figure 2-12.

CAUSES AND PREVENTION OF SHIPBOARD LAUNDRY FIRES

Recently, the fleet has experienced an unprecedented number of fires originating in laundry loads after tumbler-drying. As a matter of record, 14 shipboard laundry clothing fires were reported to the Naval Safety Center, see figure 2-13, during the period of January 1969 to October 1971. In subsequent years, an average of 7 shipboard laundry fires per year have been reported.

To determine the causes of these fires, Mare Island Naval Shipyard, Vallejo, California, conducted a study into the materials and conditions which would cause ignition of a normal shipboard load of laundry. The principle cause for the ignition of shipboard laundry fires is spontaneous combustion of residual soils (particularly paint, and drying or edible oils) and/or polymeric elastic waistband material. The two major factors in most of the fires investigated were operating personnel error and lack of adequate equipment safeguards. Washing and drying in strict accordance with the specified laundering instructions contained in chapter 5 of this manual does not lead to the high temperature necessary for the start of spontaneous combustion of most materials.

As a laundry supervisor, it will be up to you to train your personnel in the prevention of shipboard laundry fires and make them aware of procedures and instructions that will aid in the prevention of laundry dryer fires.

Chapter 5 of this text discusses the standard procedures that should be followed when drying clothes in your ship's laundry.

SUMMARY

This discussion of the ships' laundry has been general. It has attempted to give the Ship's Serviceman supervisor of a laundry examples of laundry organization, laundry schedules, and methods and procedures of operating. The organization and management of the ship's laundry varies with different types of ships. In a sense there is no real standard organization, or standard operating procedure, which will work for all laundries or even for any laundry under all conditions. The schedule of laundry work, as you learned, will vary in accordance with the needs of the ship, as will many of the methods and procedures. On your ship, most of what has been discussed in this chapter may be applicable; on other ships, variations in procedure may be necessary. You and your immediate superior will have to decide what is best for your laundry.

CHAPTER 3

FIBERS AND FABRICS

A Laundryman is concerned with fibers and fabrics. When he launders or dry cleans a particular fabric he must know what fibers compose it and how they are affected by detergents, soap solutions, dry cleaning solvents and such conditions as light, heat, moisture, and mechanical action. He must know which fabrics should be washed, and which should be dry-cleaned; and what cleaning processes are suitable for various fabrics. He must know, for example, what type of detergent is suitable for washing cotton or linen, and which is best for wool or silk. At times he may have to wash or clean fabrics made with synthetic fibers, or a mixture of different fibers. In this case, he must know what detergents are safe for washing, or if the fabrics are dry-cleaned, what chemicals and procedures to use.

In this chapter you will learn how fibers and fabrics are classified. You will also learn how fibers may be identified, and how they are affected by such things as acids, alkalis, oxidizing agents, sunlight, heat, moisture, and mechanical action.

A fiber is a slender, threadlike structure which can be processed directly (felted) into cloth, or spun into yarn or thread (several yarns twisted together), which in turn may be woven or knitted into cloth. A fabric is a woven, knitted or felted cloth. There are many different fibers and fabrics, as you will learn in the next paragraphs.

CLASSIFICATION OF FIBERS

Our classification of fibers takes into consideration their origin and chemical composition. As you will learn in chapter 4, the chemical elements in fibers determine what procedures you must use to wash and clean them. The different classifications are:

1. Natural:

   a. ANIMAL.—Animal fibers have their origin in animal life and include wool, hair, and silk. The chemical substances in these fibers are mainly proteins.

   b. VEGETABLE.—Vegetable fibers have their origin in plant life, and the ones with which you will be concerned most in the laundry are cotton and linen. Hemp, jute, and sisal, however, belong in this class. The content of vegetable fibers is primarily cellulose.

2. Manufactured:

   a. MINERAL.—Mineral fibers are made from fine strands of glass or metal. Molten glass or metal is forced through spinnerets (fine jets) to make the strands. Tinsel thread, asbestos, fiberglass, and steel wool are examples of mineral fibers.

   b. RAYON.—Rayon is put in a class by itself because it is not a true synthetic. It is manufactured from such natural fibers as cotton or wood, as explained later.

   c. SYNTHETICS.—True synthetic fibers are built up from various

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chemical compounds. Nylon, dacron, orlon, dynel, and vicara are a few types. The process for manufacturing is essentially the same–liquid solutions are forced through spinnerets to form fine fibers, or filaments–in each case, with slight variations, which are explained in the discussion for each kind of fiber. (See fig. 3-1 for further information on manufactured fibers.)

CLASSIFICATION OF FABRICS

Fabrics differ from one another in basically two respects: first, in the type of fiber of fibers which compose them, and second, in the method of process by which they are fabricated. A fabric may be made of all cotton, linen, wool, silk, or other fibers discussed above, or it may be a combination of two or more different fibers. Moreover, the fiber or fibers used in its fabrication may have been woven, knitted, or felted to produce the fabric. In identifying fabrics on the basis of their fiber composition, we speak of FIBER CONTENT, in which each fiber used is expressed in terms of the percentage comprising the fabric; e.g., 40% wool-60% cotton. In identifying fabrics on the basis of the process used in their fabrication, we employ the following basic classification:

1. WEAVE–A fabric formed on a loom by interlacing yarns or threads placed crosswise to each other. The fundamental weaves are plain, twill, and stain. All other weaves, no matter how intricate, use one of these basic weaves in their composition. There are many variations on the basic principle which make different types of fabric surfaces and fabric strengths.

2. KNIT–A fabric formed by interlocking series of loops of one or more yarns. Originally done by hand, it is now turned out by machine in mass production. Basic knits include the plain, stockinette, and rib knit.

3. FELT–A fabric built up by the interlocking of fibers by a suitable combination of mechanical work, chemical action, moisture, and heat, without weaving or knitting.

C.R.F. FABRIC

C.R.F. (crease resistant finish) fabric is treated with synthetic resins or other chemicals to resist wrinkles. Little ironing is needed, and drying time is shortened.

FIBER IDENTIFICATION

It is with the first method of classifying fabrics that of fiber content, that you as a laundryman will be primarily concerned. There are sevaral ways to find out what fibers compose a fabric. First, read the manufacturer's label on the garment, if there is one. It specifies the fiber content of the fabric and you can depend on its accuracy. Second, you can tell to a limited extent what fibers make up a fabric by its appearance and feel. This method of identification, however, is not very accurate, though you can use it with some competence after you have had some experience. Third, the most positive method for identifying types of fibers is a laboratory analysis of the fabric. Such a test, of course, is impractical aboard ship, so you'll have to use some other method to check fibers in a particular fabric. This method, the fourth one, is the BURNING TEST.

To make the burning test, pull a thread or two, or clip a small piece of fabric from an unexposed seam of the material and unravel the yarns in the piece. Then test each type of yarn by holding one end and burning the other end with a match. By observing (1) the way in which the fiber burns, (2) the odor given off in burning, and (3) the appearance of the ash, and comparing observations made with the burning test chart, you will have an adequate indication as to the identity of the fabric you are handling. See figure 3-2 for the burning test chart.

HOW LAUNDERING AND DRYCLEANING AFFECT FIBERS

Unless you take precautions, one or more of several kinds of damage may be suffered by a fabric during the washing or cleaning process. Among these are loss of tensile strength, loss of color, shrinkage, and felting. Some kinds of

Fiber	General Information	Chemical Composition
RAYON:		
Vicose	Begins to decompose in the 350°-400°F. range. Weaker when wet by about 55%.	Regenerated cellulose made from wood pulp or cotton linters, caustic soda, carbon disulfide and sulphuric acid.
Cupra-ammonium	Stretch spun. Weaker wet than dry by 45%. 20 million lbs. produced yearly.	Regenerated cellulose made from cotton linters, copper sulfate, ammonia and sulfuric acid.
Cordura	A high-tenacity rayon.	
Fiber E	A special high-tenacity rayon used in carpeting, drapery and upholstering fabrics.	
ACETATE:	Fuses and shines at 100 lbs. steam pressure. Soluble in acetone and glacial acetic acid. Weaker when wet by about 40%.	Cellulose acetate made from cotton linters, glacial acetic acid, acetic anhydride and acetone.
POLYAMIDE:		
Nylon	A polyamide. Melts 450°-480°F. Melted and spun. Soluble in concentrated formic acid, and in hydrochloric acid. About 11% weaker when wet.	Hexamethylene diamine and adipic acid.
ACRYLIC:		
Orlon	Acrylic polymer. Melts at 450°F. Soluble in dimethyl formamide. Loses 8% of strength when wet.	Acrylonitrile. Splendid resistance to weathering and chemical attack.
Dynel	Acrylic co-polymer. Melts at 275°F. Softens at a lower degree than 275°F. Produced as white and dope-dyed staple.	Acrylonitrile 40% and vinyl chloride 60%.
Acrilan	Acrylic co-polymer. Acrilan CN-33 is the code name of a new type of fiber with better dyeing qualities.	Acrylonitrile 85% and vinyl acetate 15%.
X-51	Acrylic co-polymer	Acrylonitrile and methyl methacrylate.

Figure 3-1.—Manufactured fibers. 22.67.1

Fiber	General Information	Chemical Composition
POLYESTER:		
Dacron	Polyester. Melts at 450°-480°F. Spun while molten and stretched. Made as Terylene in England and Canada.	Synthetized from terephthalic acid and ethylene glycol, producing polyethylene terephthalate.
PROTEIN:		
Vicara	Corn protein. Not affected by temperature up to 350°F. Melts at 470°F. Not affected by alkalies. Can be bleached with acidified sodium chloride.	Corn protein dissolved in caustic soda, purified and reprecipitated as fiber in acid bath. Hardened with formaldehyde. Blended with wool and other fibers.
GLASS:		
Fiberglas Virton	Glass. Has wide industrial usage. Will not burn. Strength begins to decrease at 600°F.	Color obtained by coating fiber with resin or protein film and coloring the film by dyeing or printing. Used in curtains and draperies. Cannot be machine washed.
POLYETHYLENE:		
Wynene Reevon	Polyethylene. Shrinks at 156°F. Softens at 225°-235°F.	Used in upholstery, shoe, filter, and handbag fabrics.
POLYVINYL:		
Saran Velvon	Polyvinylidene co-polymer. Melts within the 240°-280°F. range.	Vinyl chloride 15% and vinylidene chloride 85%. Used for seat covers and similar materials.
Vinyon N	Same properties as dynel but is a filament, not staple. Used for fisherman's nets, filter cloth, thread, and so forth.	Acrylonitrile 40% and vinyl chloride 60%.
Vinyon HH	Co-polymer. Shrinks at 150°F. and melts at 260°F.	Vinyl chloride and vinyl acetate.

22.67.2

Figure 3-1.–Manufactured fibers–continued.

Fiber	How it Burns	Odor	Appearance of Ash
PURE SILK	Small flame; will not smoulder after flame is out.	Burning feathers	Round, black bead that will not pulverize
WEIGHTED SILK	Will not burn after flame is removed; it chars.	Burning feathers	Leaves skeleton ash which glows like red-hot wire in a flame.
WOOL	Sizzles; small flickering flame. Will not smoulder when flame is out.	Burning hair	Irregular, black brittle ash
COTTON	Yellow flame of more intensity than silk or wool but less than rayon; smoulders with creeping ember.	Burning paper	Small, fluffy-gray ash
CELLULOSE ACETATE	Fairly rapid flare. Do not hold in flame but close enough to get melting effect.	Sharp, acrid odor	Hard, black bead that cannot be pulverized
NYLON	Goes out as soon as flame is removed.	Burning sealing wax	Hard, amber-colored bead that cannot be pulverized
ARALAC	Similar to wool	Like wool	Like wool
REGENERATED RAYON	Very rapidly; sometimes leaves creeping ember.	Burning wood	No ash

22.68

Figure 3-2.—Burning test for fibers.

damage may be caused by using too strong a chemical, or the wrong chemical. The fibers can also be damaged by excessive water temperatures, too much mechanical action in the washer, too high ironing or pressing temperature, and careless handling.

The discussion in the following pages is designed to show you how the laundering process affects different types of fibers.

COTTON AND LINEN FIBERS

Cotton and linen are grouped together in this discussion because their laundering characteristics are practically the same—their reactions to chemical cleaning agents are similar.

The cotton fiber is a flat, twisted ribbon with thickened edges. It is obtained from the white protective hairs that cover the seeds of the cotton plant. The length of a fiber varies from 3/4 to 2-1/2 inches. A cross section of a cotton fiber under a microscope shows that it is a collapsed tube with an inner canal, which absorbs and retains acids, alkalis, and soaps, and thus makes the job of rinsing more difficult.

Chemically, cotton consists almost entirely of cellulose, which is a carbohydrate composed of carbon,hydrogen, and oxygen.

Linen is obtained from the stalks of the flax plant and is one of the earliest known textile fibers. A linen fiber appears as a straight, smooth rod with a bamboo-like structure, which is due to cross markings on the fibers. These cross markings indicate that fibers have been joined together. One fiber may be as much as 3 1/2 feet in length. It is stiffer and straighter than a cotton fiber, and it also has more luster and strength. It is a good conductor of heat, and for this reason linen fabrics are desired for summer clothing. They readily conduct body heat to the atmosphere.

All mineral acids–hydrochloric, sulphuric, and phosphoric–are harmful to cotton and linen fibers. At full strength, they destroy the fibers, but in weak solutions they can be used safely. If you have occasion to use mineral acids on cotton and linen, be sure to rinse them completely from the fabric to prevent subsequent damage.

Cotton and linen fibers withstand well the oxidizing effect of laundry bleaches when used in controlled amounts. Alkalis used in soaps have little or no ill effect on them, but they should be rinsed thoroughly from the fabrics after washing is completed. High temperatures do not ordinarily affect cotton and linen fibers, although they often do affect colors.

WOOL FIBERS

The best wool fibers come from lambs approximately 8 months old; technically, however, wool includes any soft hair. For example, mohair comes from the angora goat, and alpaca comes from the llama and the camel. Rabbit hair is also classified as wool.

A wool fiber is wavy and has a scaly surface. The scales latch onto each other and cause wool fabrics to felt and shrink when subjected to heat, too much mechanical action, or alkaline solutions.

Wool fabrics are of two kinds, woolen and worsted. Woolen fabrics are made from short, loosely twisted wool fibers. Worsteds are made from smooth, long hand-twisted wool fibers. Ordinary wool fabric has a nap on the surface, but a worsted has no nap.

Woolens are not normally damaged by most mild cleaning solutions. Strong alkalis destroy wool, and ordinary laundry bleach turns it yellow. High temperatures damage wool. Too much mechanical action during the washing process is also detrimental.

RAYON

Rayon is produced from the cellulose of cotton or wood. The cotton fibers, or wood pulp, are treated with caustic soda, filtered, and mixed with carbon disulfide. This solution is then aged for a definite period and forced through spinnerets to form fibers.

When wet, rayon is ductile and subject to damage when tension is applied to the fabric. It holds up well under temperatures as high as 400° F. It can be washed in a fairly strong alkali and is not affected by laundry bleaches and sours.

CELLULOSE ACETATE

Cellulose acetate is made from cellulose and acetic acid. At one time it was called by the same name as rayon, but is now classified separately because it reacts differently. Unlike rayon, cellulose acetate dissolves in acetone and glacial acetic acid, and it will melt under a hot iron or in a hot dryer.

NYLON

The elements in nylon are adipic acid and hexamethylene diamine. When the filaments come from the spinnerets they are twisted to form yarn, which are then stretched by running them over a system of rollers to strengthen them.

Nylon is used in shirts, nurses' uniforms, sail cloth, parachute cloth, loading nets, socks, underwear, and so on. Because of their strength, nylon fibers are used frequently with other fibers to make a strong fabric.

When wet, the strength of nylon is reduced by approximately 11 percent. Nylon is soluble in concentrated acids, but withstands temperatures up to 450° F. although distortion of the fabric will occur at 200°F. Colored nylon fibers blended with wool sometimes bleed their color on the wool fibers because they dry rapidly and draw water from the wool fibers.

DACRON

Dacron is made from terephthalic acid and ethylene gycol. It is used in shirts, ties, blouses, curtains, socks, sweaters, and with many different fibers to form blends. Dacron and wool, for example are used rather extensively in suits, to improve the appearance and reduce wrinkling.

A satisfactory ironing temperature for dacron is 275°F; but when it is heat-set to prevent shrinkage, it can be ironed at lower temperatures. It melts at a temperature around 480° F. It is highly resistant to most chemicals used in the laundering process, and is just about as strong wet as dry. Unlike nylon, it shows very little heat yellowing. It can recover from wrinkling. It absorbs much moisture but dries quickly. Unlike cotton or rayon, however, it loses strength if exposed too long to sunlight.

ORLON

Orlon is used for shirts, suits, lingerie, curtains, sportswear, rainwear, and in various blends with wool and other fabrics. One effect of this blending is to strengthen the fabric; for example, a fabric of 75% wool and 25% orlon is stronger than a fabric of 100% wool.

Orlon resists wrinkling in use, although it will form wrinkles in an extractor. A blend of 50% wool or acetate, and 50% orlon has the ability to resist and/or recover from wrinkling, as does a blend of 80% orlon and 20% cotton.

Orlon fibers are not affected by common laundry supplies. Sunlight and atmosphere have little effect on them. Shrinkage in boiling water is low and, if properly heat-set, they will not shrink further when pressed. They have a low moisture pick-up and dry rapidly, but they have a tendency to turn yellow when pressed at 300 to 330° F. Industrial orlon fabrics resist heat, weathering, and industrial acids. For this reason, they are good for such things as awnings.

DYNEL

Dynel fabrics are used in blankets, draperies, knit sweaters, and in blends with other fibers. Because they resist alkalis and acids, they are also used to make shirts and coveralls for men who work with chemicals

Dynel dries very quickly and is fire-resistant. It is warm, and is as strong wet as dry. It resists clothes moths and carpet larvae, and is not affected by mildew or fungus growths of any nature. Most chemicals used in washing have no effect on it. Dynel resists sunlight. In dry cleaning it can be spotted with any of the usual chemicals except acetone, which dissolves the fibers.

Boiling water does not affect dynel fibers, but a pressing temperature higher than 240°F results in serious shrinkage. Dynel hose cannot be dried on closed steam-heated stocking forms, as the forms shrivel them.

ACRILAN

Acrilan fibers are made by forcing a mixture of 85% acrylonitrile and 15% vinyl acetate through spinnerets. They are light cream in color and have a semidull luster. They are used principally in blends.

Acrilan fibers do not shrink when heat-set. They have good resistance against chemicals used in the laundry, and also against moths, mildew, and sunlight. Because of their moth resisting quality, acrilan fibers are used with wool fibers to increase the usefulness, or life span of the cloth.

GLASS FIBERS

Glass fibers are made by forcing molten glass through spinnerets with steam under high pressure. The fibers, about 9 inches long, are passed through a burst of flame to evaporate moisture and are then gathered on a revolving drum. The accumulation of SLIVER (as it is called) follows grooved wheels and is wound on revolving spools. Spinning and weaving are then carried out on ordinary textile machinery.

Because they do not burn, glass fibers are used for curtains and draperies, gloves, and various other articles.

Never wash glass fibers in the washing machines. The recommended procedure for washing is to soak them in water in which a mild soap has been dissolved. You may dunk the material in water, but DO NOT rub it. Rinse in clear water to which you have added a few drops of mineral oil, to add luster to the fibers. You can also lay glass fabric on a flat surface and clean it by hand with a sponge.

After you dry glass fabrics by hanging them, you can iron them with a press or iron at a low heat temperature.

Figure 3-3 offers further information on manufactured fibers.

Fiber	Detergent at Laundry Concentration* pH 10.0 to 11.2	Bleach at Laundry Concentration of 100 Parts Per Million	Laundry Sour at pH 5.0	Effect of Pressing (100 pounds steam pressure gives pressing temperature of 338°F.)	Stoddard Solvent and Perchlorethylene	Effect of Sunlight
Acetate	Resistant	Good bleaching agent	Resistant	Shines at about 275°F. Sticks to iron at 350°F. to 375°F.	Resistant, but is soluble in acetone, phenol, and glacial acetic acid (1)	More resistant than viscose, but is degraded by sunlight
Acrilan	Resistant	Of no value (see 2)	Resistant	Sticking point 455°F.	Safe to use	Loses strength gradually
Cotton	Resistant	Good bleaching agent	Resistant	Starts to decompose at 302°F. Not harmed on press as evaporating moisture cools fabric	Resistant. Cotton should be washed, not dry cleaned	Loses strength gradually
Dacron	Resistant	Of no value	Resistant	Melts at 480°F.	Safe to use	Loses strength gradually
Dynel	Resistant	Of no value	Resistant	Fusing starts at about 246°F.	Safe to use. Soluble in hot acetone and in dimethyl formamide	Darkens. Some strength loss
Nylon	Resistant	Of no value	Resistant	Yellows at 300°F. Melts at 482°F.	Safe to use. Soluble in concentrated formic or 20% hydrochloric acid	Good resistance for bright yarns: less for semi-dull
Orlon	Resistant	Of no value	Resistant	Yellows at 300 to 330° F. Sticking point 455 to 480°F.	Safe to use	Resistant
Vicara	Resistant	Acidified sodium chlorite is required. Laundry bleach chlorinates and yellows Vicara	Resistant	No effect up to 350°F. Melts at 470°F.	Safe to use	Loses strength slowly
Viscose	Resistant	Good bleaching agent	Resistant	Decomposes at 350 to 400°F.	Safe to use	Loses strength gradually
Wool	Resistant up to pH 10.5 at laundry concentrations. Soluble in hot 5% potassium hydroxide solution.	Chlorinates and yellows wool. Hydrogen peroxide or sodium perborate are satisfactory bleaching agents	Resistant	Decomposes at 266°F.	Safe to use	Loses strength gradually

* The pH Scale measures the activity of an acid or base in a solution.

(1) Fortisan is insoluble in acetone

(2) The acrylic fibers are bleached with hot acidified sodium chlorite solutions under mill conditions. Method is not recommended for laundry use because of chlorine dioxide fumes that are released.

(3) The acrylic fibers are soluble in dimethyl formamide

Figure 3-3.–Fiber laundering characteristics.

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POLYESTER

Polyester is a generic (general) term for a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer compound. The polymer compound being at least 85 percent by weight of an ester of dehydric alcohol and terephthalic acid.

The basic chemicals from which polyester fiber is made come from coal, air, water, and petroleum.

Polyester resists wrinkling in use and stays fresh looking. It holds press or pleats. Polyester wrinkles when not processed in accordance with recommendations made in chapter 4 of this text. When the recommended procedure outlined by manufacturers is followed, tumbler dryer finishing can produce acceptable results.

Polyester fibers are stronger and more abrasion-resistant than cotton. Bleaching is not needed but the fabric is not damaged by ordinary chlorine and oxygen bleaches (when they are used properly).

CHAPTER 4

WASHING

Washing is the process used to remove soil from fabrics; a series of baths during which soil is loosened from the fabrics, suspended in the water, prevented from redepositing on the clothes and finally rinsed away. Several baths are usually necessary to effect complete soil removal.

To assist in soil removal and suspension, a synthetic detergent and alkali are used in the first baths. These baths are generally called suds baths and their number varies with the type of clothing and the amount of soil in the clothes.

In washing white cottons, bleach is used to remove stains and maintain whiteness.

A sour bath is used after the other rinses to neutralize alkalinity and to decompose any remaining traces still in clothing. Generally, the sour bath is used on the last rinse cycle of the washing formula. A combination sour/blue product should be used.

GENERAL DESCRIPTION OF WASHER/EXTRACTORS

A laundry washing machine has two basic parts: (1) the outer shell, and (2) the revolving cylinder within the shell. The shell holds the water and cleaning ingredients. The cylinder holds the clothes and is perforated to allow water and suds in the bottom of the shell to enter it, saturate the clothes, and then clean them during the running process.

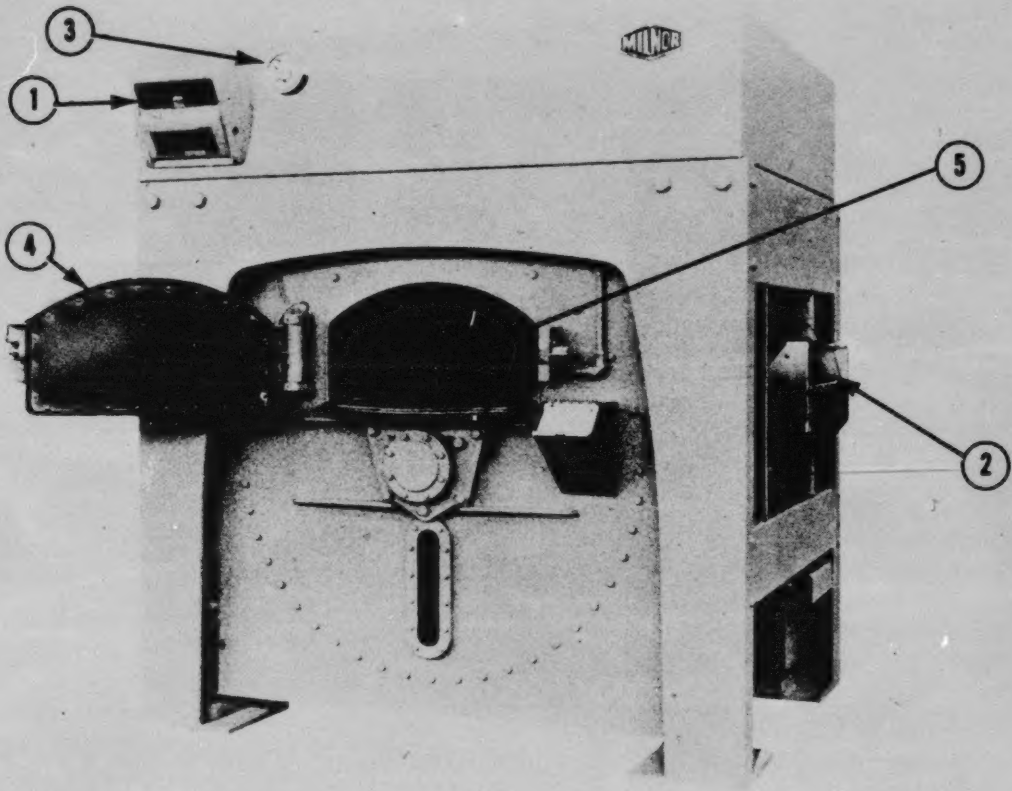
The washer-extractor washes clothes and then immediately extracts the water from them by centrifugal force in the same cylinder. A separate extract motor spins the cylinder in one direction at high speed to remove the water. This type of machine has several important advantages for the shipboard laundry.

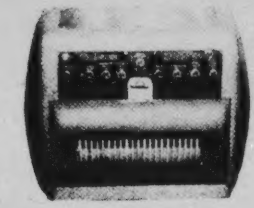
- It saves deck space.
- It speeds up the washing cycle for each load.
- By extracting after a rinse bath, it reduces the number of rinses required.
- Its final warm rinse helps to speed up drying and ironing.
- It eliminates the time and labor required to transfer wet work from washer to extractor.
- It automatically programs the washing and extracting formula you desire.

In most washer-extractor models there is a stainless steel supply dispenser consisting of several compartments. Premeasured supplies are placed in their respective compartments prior to the start of each load. The contents of the compartments automatically dispense into the machine according to the formula punched.

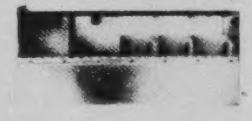
Most machines have an automatic cool-down device. This automated device minimizes wrinkling of polyesters and poly-cottons by gradually lowering the water temperature in the last rinse.

Study the washer-extractor illustrated in figure 4-1. Most of the important features, or parts, of the machine are indicated with numbers.

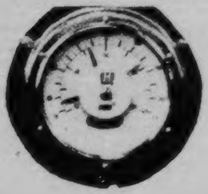




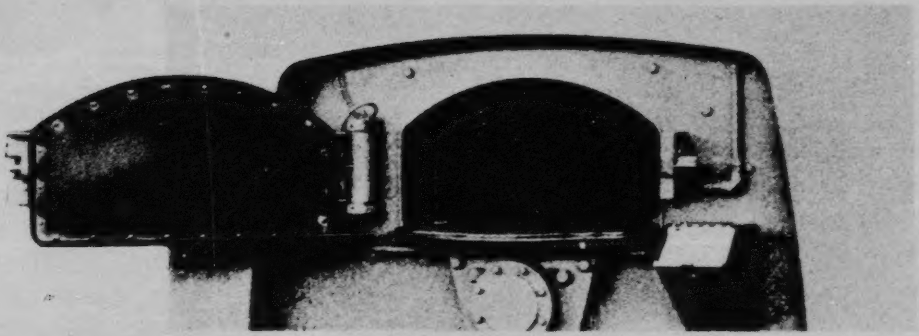
1. Timer. The timer automatically programs any washing and extracting formula desired. Formulas can be changed in seconds, simply by replacing an unbreakable plastic formula chart. One chart can hold two or more formulas. Full manual controls are also provided so that you can develop new formulas and for occasional "odd runs."



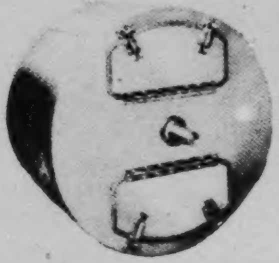
2. Automatic Supply Injector. Supplies are placed into the injector's five compartments at the beginning of each wash. At the proper time in the cycle, the supplies are completely flushed into the cylinder. This model washer-extractor uses a separate source of water and separate control to flush each supply. Supplies are injected when you want, from as many compartments at once as required. Supplies are thoroughly diluted prior to injection into the machine. This greatly improves washing efficiency and provides considerably better operations for souring and blueing.



3. Temperature Control. The combination thermometer-thermostat (standard equipment on the model illustrated) provides precise temperature—a necessity for laundering permanent press. The operator can set two thermostatically controlled temperatures by dialing them on the face of the instrument (these two temperatures are different from the dual temperature cooldown). So, the machine can attain five temperatures: Hot, cold, mixed, and two thermostatically controlled temperatures.



4. Loading doors. Loading doors open just 37 inches above the washroom deck for easy loading. These continuously hinged inner cylinder loading doors are constructed entirely of stainless steel. They project deeply into the cylinder to prevent the load from being pinched between the cylinder and the shell, and to prevent the load from dropping between the cylinder and the shell. Each cylinder door is equipped with two spring-loaded door locks to provide positive safety against accidental door-opening while in operation. The outer shell door is completely interlocked to prevent opening until the cylinder has returned to a safe rotating speed.



5. Cylinder. Scientifically spaced perforations in the cylinder side sheets and partitions provide a very high percentage open area. Allows maximum dispersion and interchange of the washing solutions for highly efficient soil removal—plus free flow of water during extraction cycles.

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Figure 4-1.—Automatic washer-extractor.

OPERATION OF THE WASHER-EXTRACTOR

Although construction details of the various washer-extractors used afloat vary, the principle of operation is the same. Listed below are general steps to follow in operating the washer-extractor. Refer to the manufacturer's instruction manual for additional information on the operation.

1. Open the shell door.
2. Turn on the switch.
3. Rotate the cylinder with the INCHING button, and stop when the cylinder door is approximately opposite the shell door opening.
4. Inch the cylinder into exact position opposite the shell door.
5. TURN OFF THE SWITCH. Do not trust the shell door safety switch.
6. Open the cylinder door.
7. Bring the apron into position over gap between cylinder and shell doors.
8. Load the washer to the RATED CAPACITY ONLY (to 75 percent of capacity when washing polyester or polyester blends). Overloading a washing machine is one of the chief causes of breakdowns, as a greater strain is placed on all moving parts, particularly the motor, than the manufacturer intended. Overloading also results in poor washing, because the water and cleaning solution do not have adequate space and sufficient agitation to remove soil. Underloading on the other hand, results in a waste of water and cleaning supplies. You should therefore weigh every load of clothes for each compartment in the cylinder. This is very important. Place lot number tag on washer.
9. Swing the apron down and out of the way.
10. Close the cylinder door. Be certain it is securely latched and that the latch handles are in the latch wells.
11. Close the shell door and tighten.
12. Add the required supplies to the automatic supply dispenser.
13. Set the formula card and turn the switch on.

In the event your automatic programmer becomes inoperative or your ship has manually operated washer-extractors, after the 11th step above, proceed as follows:

12. Turn the switch on.
13. Start the cylinder.
14. See that the dump valve is closed.
15. Add water to the proper level and at the proper temperature, as indicated on the gages. If the water is not hot enough, use steam to bring it to the desired temperature.
16. Add detergent, liquid or dry as prescribed by the washing formula, through the supply door when the cylinder is passing the supply door in the downward direction.
17. Start timing the bath (follow formula).
18. When time of bath has elapsed, release the dump valve.
19. Permit sufficient time for the water to drain from the shell after the water level reads zero, and then close the dump valve.
20. Repeat steps 15 through 19 until the washing formula is completed. (See formulas later in this chapter.)
21. After the last bath, leave the valve open for more complete drainage.
22. Start the extraction cycle. Move the switch to extract position. When extraction is completed, move the switch to wash or inch position, as desired.
23. Push the stop button, loosen the handwheel, and open the shell and cylinder doors. Unload the top half of the washer and close the cylinder door. Rotate the cylinder one-half turn and unload the other half of the cylinder.

SAFETY DEVICES

Safety devices on washers and washer-extractors conform to Navy specifications. The shell door, for example, is fastened with latches connected to a safety switch which cuts off the power and applies the brake when you open the door. As a safety measure, however, it is best not to trust the safety device when loading or unloading. TURN OFF THE POWER.

START and STOP buttons are provided on the control panel, and there are INCH buttons for getting the cylinder into the correct position for loading and unloading. When the cylinder is thus spotted, an automatic safety switch on the wash motor prevents it from moving farther. The magnetic reversing control is enclosed in a metal cabinet as a protection for the control itself and also as a safety measure. All safety devices are intended to protect you. Understand them thoroughly and ensure that they are ALWAYS functioning properly. Listen for unusual noises or other signs of improper functioning such as overheated motors, smoking brakes, slowing down of normal speed. Stay near the machine during the extraction cycle. Be ready to cut-off power should there be any excessive vibrations. Most laundry washer-extractors are provided with vibration safety shut off.

CARE AND MAINTENANCE

The washer-extractor is a very important and expensive piece of equipment. If it breaks down, time and money are consumed, perhaps unnecessarily, and the ship's company may be subjected to inconveniences and unsanitary living conditions. Therefore, too much emphasis cannot be placed upon the proper care and maintenance of the washing machine.

The senior laundryman and all operators are responsible for the care of washer-extractors. CARE has reference to the manner in which you handle the machine, and how clean you keep it. In a word, the washer should be kept as clean inside and outside as possible. Soap solutions and hot water help to keep the inside clean and sanitary, but scum and other accumulations should be removed daily from the exterior.

An oxalic acid solution made by dissolving 1/2 pound of oxalic acid crystals in a gallon of water can be used to keep the outside of the tub clean and bright. Use a rag or brush to apply the solution. Rub vigorously, and then rinse with clean water. A fine abrasive powder, such as pumicestone, sprinkled on the damp cloth will help to remove grease and film from the tub.

The washer should be inspected at regular intervals to ensure that:

- It is level.
- All bolts, nuts, and screws are tight.
- Water, steam, and dump valves are tight and do not leak.
- Latches on the cylinder doors are operating properly, and bolts are tight.
- The brake is properly adjusted.
- All bearings and moving parts are clean and lubricated.
- The thermometers are accurate.
- Motors are cleaned and oiled.
- Switches are properly adjusted and working correctly.
- The timers are in good working order.
- All electric controls are functioning.
- The clutch operates smoothly.
- Water level gages are correct.
- All safety devices are functioning properly.

The operator of a washer should know his machine. He should study the manufacturer's instruction book and the machine itself until he is able to recognize when any part of the machine is not operating properly. He should promptly report any necessary adjustment or repairs required on the washer to the "A" division.

WASH WATER

Water is the most important item used in a laundry. Not only is it needed in quantity, but the quality of water used has an important effect on the washing process.

At sea, where quantities of suitable wash water are always subject to greater limitations than ashore, you may not always have enough soft water available. To conserve fresh water, you may be required to use sea water.

When water comes from clouds as rain or snow it picks up carbon dioxide gas. As the water seeps through the ground, the carbon dioxide gas dissolves limestone and some other substances; and the water collects calcium and magnesium salts. These salts are in the form of bicarbonates, chlorides, nitrates, and sulfates. The kind and quantity of these substances is determined by the soil the water passes through. Water that contains an appreciable quantity of salts is HARD water. SOFT water is water that has not picked up salts from the earth, or water that has had these substances removed or neutralized. Since it contains the concentration of salts, sea water is the hardest of all wash waters.

TYPES OF HARD WATER

In laundry terminology, hardness in water is the power to kill soap. When soap is added to hard water, the calcium and magnesium salts in the water combine with the soap to form insoluble lime soaps. These soaps then unite (precipitate) in the form of a sticky, insoluble deposit. This reaction kills the soap and makes it useless for washing, and the sticky deposit traps dirt and puts it back on the fabric in the form of scum. If no dirt is present, the scum is white and is seen as a film on the clothes.

There are two types of water hardness:

1. TEMPORARY HARDNESS.—Water which contains calcium and magnesium bicarbonates is called temporary hard, because these elements can be removed by boiling. Scale on the inside of steam kettles and steam boilers is due to the precipitation of insoluble carbonates as the hard water is boiled. If it were possible for you to boil all the water used for washing, you would need no other method for eliminating temporary hardness. This is not usually possible aboard ship, however, and you must use another method to make the water soft.

2. PERMANENT HARDNESS.—Water which contains calcium and magnesium chlorides, which are NOT affected by boiling, is said to be permanently hard. Permanent hardness requires special treatment with chemicals or by distillation.

HOW TO SOFTEN WATER

The methods generally used to soften water are considered in the next paragraphs. They are known as the BASE-EXCHANGE and DISTILLATION methods.

The base-exchange method softens water when the compounds of calcium and magnesium in the water are exchanged for compounds of sodium, which do not cause hardness. The sodium is contained in the form of a sand called zeolite, a natural mineral known as sodium aluminum silicate. When hard water is run through the zeolite sand, calcium and magnesium in the water change places with the sodium. Eventually, the zeolite loses its strength, but it can be regenerated (renewed) by the addition of sodium chloride (salt), which converts it to the original state.

Distillation is the process whereby water is boiled and the vapor cooled by running it through pipes immersed in a cold solution to reconvert it to water. Distillation is used to make sea water usable for a ship's boilers and other shipboard uses. Sea water distillate is not pure water, but it contains only about 1/20,000 of its original concentration of salts.

TYPES OF SOIL

Three types of soil must be removed by the washing process. The first consists of soluble soils such as starches, fruit juices, and sugars.

The second type includes the soils INSOLUBLE in water: earth, soot, oils, paint, and fats. The third type consists of colored stains such as dye, blood, medicinal stains, and rust.

Water removes soils which are soluble in it. Soap removes many kinds of insoluble particles and holds them in suspension in the water. Alkali chemically changes some substances in soils and makes them soluble. Some colored stains can be removed entirely by water alone; others require suds baths or special treatment.

DETERGENTS

Detergents are sometimes referred to as synthetic detergents or synthetic soaps. The term synthetic, in its broadest sense, refers to the synthesis (building up) of materials to form a product different from natural substances. A detergent, as the term is generally used, is entirely different from a soap.

Detergents now on the market may be divided into three classes, in accordance with their physical mixtures: (1) true, or 100 percent synthetic material; (2) mixtures of alkalies and synthetics, and perhaps some minor ingredients; and (3) promoted synthetics (mixtures of synthetics, alkalies, and other materials designed to increase or promote one particular property of the detergent). Detergents are equally efficient in hard, seawater, and soft water. Detergents are little affected by alkalies or acids and are effective in hot or cold water.

Cotton and linen absorb alkalies in soaps and soap builders in small quantities only, but wool has a great affinity for alkalies and absorbs large quantities of them. For this reason, detergents without builders are much better for washing woolens and silks. Check the fiber laundering characteristics chart in chapter 3 for effects of detergents on synthetics.

The detergents to be used in washing all shipboard clothing and textile items, including synthetics and synthetic blends, are those stocked in the Supply System and procured as Type I and Type II detergents of Federal Specification P-D-245C Detergent (Powder, Flake, Bead or Granular) for Laundry and Dishwashing. Both types have controlled, low-sudsing features, are biodegradable, and have been specially formulated to have performance features that equal more expensive commercially available detergents. Comments concerning the use and properties of P-D-245C detergents apply to the P-D-245B and MIL-D-12182F detergents that are still in the supply system. The latter detergents are being phased out of the supply system.

The Type I laundry detergent is intended for laundering 100 percent cotton (white and colored), white synthetic and synthetic-blend fabrics (including permanent press) in soft and hard water.

The Type II laundry detergent is intended for laundering woolens and colored synthetic and synthetic-blend garments (including permanent press items) in soft, hard, and sea water and all-cotton items (white and colored) in sea water.

Both types of detergents contain: (1) surfactants (surface active agents) to change the surface properties of water so that dirt can be more easily removed; (2) mildly alkaline salts that act as water softeners to provide proper alkalinity for good cleaning and to help suspend and disperse soil; (3) optical brighteners (fluorescent whitening agents) which, when absorbed on fabrics during washing, convert some of the invisible ultra-violet light in sunlight to radiation the eye can see. These brighteners make white fabrics appear whiter and colored fabrics appear brighter in natural daylight or under fluorescent lights. Optical brighteners assist bleaches in making fabrics whiter but are not substitutes for bleaches, and they do not have germicidal or stain-removal properties; (4) compounds that keep the loose soil from redepositing on fabrics; and (5) other alkaline salts that assist the "free flowing" properties of detergent powders and reduce damage to metal parts of washers.

ALKALINE AGENTS/BUILDERS

Use of alkaline agents (builders) should be limited to those washes that require them. They should be used only in small quantity and not at all on silks and woolens. If too much builder is used, extra rinses are required to get the alkali out of the clothes. In addition, the extra quantity of alkali has a tendency to reduce the tensile strength of all fabrics.

The principal soap builders are the phosphates, sodas, and silicates. They include sodium bicarbonate, borax, sodium carbonate, sodium silicate, and sodium metasilicate. Sodium silicate is the alkali most commonly used as a builder. In addition to its good qualities as a builder, sodium silicate also has emulsifying properties. Trisodium Phosphate is especially good for removal of paint. Sodium metasilicate is an alkali which is safe for use on cotton and linen fibers.

AMOUNT OF BUILDER

Alkali builders recommended for the ship's laundry are listed in *Ship's Store Afloat Catalog* and Appendix I of this text. They should be stocked aboard ship for use with certain types of water and for use in cotton wash formulas as noted therein.

WASHING FORMULAS

Washing formulas given on pages 47, 48, 49, 50, and 51 have been tested in laundries aboard ship and in naval research facilities and found satisfactory for the type of work indicated.

These formulas include procedures for the shipboard laundering of synthetic and synthetic-blend fabrics, cotton fabrics, and woolens, in soft, hard, or sea water. It should be noted that the formulations contain, for the first time, a water-soluble liquid non-ionic detergent that is used in conjunction with the Type I and Type II detergents of Federal Specification P-D-245C. This liquid detergent provides improved soil removal of grease, oil, and dirt from heavily soiled fabrics, even on fabrics of the oil-retentive type (synthetic blends and permanent press). The liquid non-ionic has been included in the list of commonly used shipboard laundry products.

To determine the correct amount of chemicals for your washer, multiply each 100 pound capacity of washer-extractor or fraction thereof by the amount of chemicals in the "supplies" column of your formulas. The amount of chemical supplies added should be determined by the capacity of the washer-extractor. For example, if a 50-pound load is put into a 100-pound washer-extractor, the amount of supplies added should be that required for the 100-pound load. On the other hand, if a 50-pound load is put into a 50-pound washer-extractor, the amount of supplies is one-half that required by the 100-pound formula.

It is important to bear in mind that cottons can be successfully laundered in polyester formulas but polyesters cannot be successfully laundered in some cotton formulas.

The ideal laundering situation would permit separation of the various fabrics and use of tailored wash deck procedures for each category. This, of course, is not a practical approach. Consequently, an effective compromise must be worked out to obtain the best overall results on a mixed load basis. The objective is to obtain a high level of cleanliness.

Generally, the following guidelines should be observed in the processing of permanent press and polyester blends:

1. Washer-extractors should be loaded to only 75 to 80 percent of capacity to permit greater water volume ratio to load.

2. Addition of non-ionic detergent as load is being wet down and addition of detergent (and alkali when required) immediately after water level is reached.

3. Control changes of water bath temperatures—limit 20°F until final rinse temperature is reached.

4. Minimize souring.

5. High break temperatures can be tolerated with proper use of correct detergents (non-ionic).

6. Separate classification of cottons, synthetics and blends are worthwhile only where sufficient volumes are involved.

NAVY FORMULA I

CLASSIFICATION: 100% Cotton – Whites and Wiping Towels, etc.

P-D-245C Detergent

Hard/soft water – Type I
Sea water – Type II

100-pound-load basis

Step	Notes	Operation	Cycle Time Min.	°F Water Temp.	Water Level	Supplies/100-pound load
1	*	Break	8	150-160	Low	16 oz. alkali 2 oz. non-ionic liquid
2		Suds	7	160	Low	8 oz. detergent
3		Bleach	6	160	Low	2 oz. dry organic bleach
4		Spin	1	X	X	
5		Rinse	3	160	High	
6		Rinse	3	140	High	
7	A	Sour	4	120	Low	2 oz. sour/blue
8	B	Starch	6	120	Low	10-12 oz. instant dry (if required)
9		Final Spin	6	X	X	

Water Level – Low 4"- 5" High 8"- 9"

NOTES: *Add non-ionic liquid while water is being added.
A. Bacteriostats are added in this operation, if required.
B. Drop sour bath to two inches, close dump, add water to obtain low level, then add starch.

For Sea-Water Washing: Use sea water in steps 1, 2, 3. Use fresh water in steps 5, 6, 7.

Step 1 – Use 16 oz. Type II detergent in place of alkali.
Step 3 – Eliminate bleach operation.

NAVY FORMULA II

CLASSIFICATION: 100% Cotton Colored – Khaki, Dungaree, etc.

P-D-245C Detergent

Hard/soft water – Type I
Sea water – Type II

100-pound-load basis

Step	Notes	Operation	Cycle Time Min.	°F Water Temp.	Water Level	Supplies/100-pound load
1	*	Break	8	150-160	Low	16 oz. alkali 2 oz. non-ionic liquid
2		Suds	7	160	Low	8 oz. detergent
3		Spin	1	X	X	
4		Rinse	3	160	High	
5		Rinse	3	140	High	
6	A	Sour	4	120	Low	2 oz. sour/blue
7	B	Starch	6	120	Low	10-12 oz. instant dry (if required)
8		Final Spin	6	X	X	

Water Level – Low 4"- 5" High 8"- 9"

NOTES: *Add non-ionic liquid while water is being added.
A. Bacteriostats are added in this operation, if required.
B. Drop sour bath to two inches, close dump, add water to obtain low level, then add starch.

For Sea-Water Washing: Use sea water in steps 1, 2. Use fresh water in steps 4, 5, 6.

Step 1 – Use 16 oz. Type II detergent in place of alkali.

NAVY FORMULA III

CLASSIFICATION: Synthetic-Blend Whites

P-D-245C Detergent

Hard/soft water – Type I
Sea water – Type II

100-pound-load basis

Step	Notes	Operation	Cycle Time Min.	°F Water Temp.	Water Level	Supplies/100-pound load
1	*	Break	8	150-160	Low	16 oz. detergent 2 oz. non-ionic liquid
2		Suds	4	160	Low	8 oz. detergent
3		Spin	1	X	X	
4		Rinse	3	160	High	
5		Rinse	3	140	High	
6	A	Sour	4	120	Low	1 oz. sour/blue
7		Final Spin	X	X	X	

Water Level – Low 4"- 5" High 8"- 9"

NOTES: *Add non-ionic liquid while water is being added.

A. Bacteriostats and antistats are added in this operation, if required.

For Sea-Water Washing: Use sea water in steps 1, 2.
Use fresh water in steps 4, 5, 6.

Step 1 – Type II detergent is used.
Step 2 – Type II detergent is used.

NAVY FORMULA IV

CLASSIFICATION: Synthetic-Blend Colored – Khaki, Dungaree, etc.

P-D-245C Detergent

Hard/soft water – Type I
Sea water – Type II

100-pound-load basis

Step	Notes	Operation	Cycle Time Min.	°F Water Temp.	Water Level	Supplies/100-pound load
1	*	Break	8	150-160	Low	16 oz. detergent 2 oz. non-ionic liquid
2		Suds	4	160	Low	8 oz. detergent
3		Spin	1	X	X	
4		Rinse	3	160	High	
5		Rinse	3	140	High	
6	A	Sour	4	120	Low	1 oz. sour/blue
7		Final Spin	X	X	X	

Water Level – Low 4"- 5" High 8"- 9"

NOTES: *Add non-ionic liquid while water is being added.

A. Bacteriostats and antistats are added in this operation, if required.

For Sea-Water Washing: Use sea water in steps 1, 2.
Use fresh water in steps 4, 5, 6.

Step 1 – Type II detergent is used.
Step 2 – Type II detergent is used.

NAVY FORMULA V

CLASSIFICATION: Woolens and Non-Fast Colors – (Cotton or Synthetic Blends)

P-D-245C Detergent

Hard/soft water – Type I
Sea water – Type II

100-pound-load basis

Step	Notes	Operation	Cycle Time Min.	°F Water Temp.	Water Level	Supplies/100-pound load
1	A,*	Break	6	100-120	Low	2 oz. non-ionic liquid 10-12 oz. detergent
2		Suds	3	90-100	Low	5-6 oz. detergent (if required)
3		Spin	1	X	X	
4		Rinse	3	90-100	High	
5		Rinse	3	90-100	High	
6	B	Sour	3	90	Low	1 oz. sour/blue
7		Final Spin	3	X	X	

Water Level – Low 4"-5" High 8"-9"

NOTES: *Add non-ionic liquid while water is being added.

A. Type II detergent is preferable, however Type I can also be used.
B. Bacteriostats and antistats are added in this operation, if required.

For Sea-Water Washing: Use sea water in steps 1, 2.
Use fresh water in steps 4, 5, 6.

Step 1 – Type II detergent is used.

SUDS BATH

A suds bath should remove soil from fabrics. The first step in creating a suds bath is WETTING OUT, or saturating the clothes with water and the detergent solution. Follow the recommendations of the washing formula for each type of load. When clothes are heavily soiled, you may have to increase the number of suds baths.

SUDS LEVELS AND TEMPERATURES

Suds levels recommended in the washing formulas are based upon years of experience in ships laundries. Normally, suds baths should be run at relatively low water levels in order to get sufficient mechanical action and to conserve water and detergent. Use a higher water level for woolens, however, in order to reduce agitation. You will learn about washing woolens a little later in this chapter.

Follow the temperatures listed in the formulas. If the water is not hot enough you will need steam to heat the water. However, remember to add a little less water than specified for the load, for the steam will raise the water level. Detergent or bleach should not be added to the wash water until the proper temperature has been reached.

When washing polyester and polyester/cotton blends, control changes of water bath temperatures–limit changes to 20°F to avoid "shock" setting of wrinkles until final rinse temperature is reached. Hospital linens that are blood stained should be given an initial cool water 70°F to 80°F rinse to avoid setting of blood stains. This can be done manually prior to starting formula card action.

SALT WATER WASHING

To conserve fresh water supplies, it may be necessary on occasion that you use sea water for washing. When this is necessary, use Type II detergent.

Formulas presented have been tested for effective salt water washing. Some adjustment in supply levels may be required in salt water washing.

Even though you must use sea water for washing, use fresh water for the last two rinses.

WOOL WASHING

Generally, you will not wash woolen clothing in the ship's laundry. You may find it necessary, however, to wash blankets or other woolens. If so, proceed as prescribed by the recommended formula.

Water at Navy Formula V temperature will not damge wool fibers. Hold mechanical action to a minimum to prevent shrinkage. This is why you should stop the machine when filling and draining water, and run it low speed and for short periods.

IMPREGNATED CLOTHING

On occasion you may be called upon to launder impregnated clothing. When such is the case, use Type II detergent at a maximum water temperature of 90°F. High water temperature, strong soaps, and alkalies will destroy the impregnant. If possible, water from the ship's evaporators should be used and a good suds built up before the clothing is added.

The clothes should be washed for 15 minutes at the customary suds level, changing the solution every five minutes. When washing the jumpers and overalls, the washer should not be stopped during the draining and refilling operations. However, with the wool gloves and cotton-wool socks, the washer should be stopped for draining and refilling. After the three five-minute SUDSINGS, the clothes should be rinsed three times with clear water at 90°F, allowing three minutes for each rinse.

Drying temperature must not exceed 155°F. Clothing must be tumbled at room temperature for a period of 10 minutes before removal from the tumbler. For additional information on drying refer to chapter 5.

BLEACHING

Bleach whitens cotton fabrics, has a germicidal action and helps in the removal of some stains. The dry organic chlorine-bleach powders are most effective. To prevent fabric damage, bleaches should never be added directly on the fabrics. Neither bleaches nor optical brighteners are substitutes for good laundry practices. Indeed, when washing is properly accomplished, very little bleach is required. Chlorine bleaches are not recommended for use in laundering white synthetic, synthetic-blend or permanent press items.

If improperly used, bleach in concentrated form damages fibers. Study the fiber laundering characteristics chart in chapter 3 to find out how bleach affects fibers, including synthetics.

Bleach should be added only after the correct water bath temperature is reached. The correct temperature is between 140°F and 160°F. Any temperature below 140°F slows down the bleaching action and results in poor quality product and waste of laundry supplies. Any temperature above 160°F speeds up the bleaching process and may possibly damage the clothing.

A laundry bleach conforming to Specification O-B-420 is authorized. This laundry bleach contains a minimum of 15 percent available chlorine and is available in 25 pound boxes under NSN 6850-00-053-2842. Labeling instructions for this bleach still indicate the need for keeping it out of contact with combustible materials and in a dry area.

COLOR STRIPPERS

Color strippers are used to remove dye from fabrics. For shipboard use, the high potency liquid titanium stripper is recommended. It will safely remove fugitive dye stains from white and colored articles in laundry and drycleaning.

Color strippers are ineffective against vat dyes. Refer to the detailed instructions in the stain removal chart in chapter 10.

RINSING PROCEDURE

You already have learned that the function of rinses is to remove soil and cleaning solutions from clothes after each suds bath. Poor rinsing results in grayness, disagreeable odors, harsh finish, and generally poor quality work.

The number of rinses varies. Such factors as the condition of the load (amount of soil) and amount of detergents used determine the number of rinses required. Modify your washing formula accordingly. Dirty dungaress, for example, require more rinses than lightly soiled linens. Under normal conditions, follow the washing formula with respect to the number of rinses, the rinse water levels, water temperature, and time of running.

Regardless of the number of rinses given to a load of clothes, it is impossible to remove all alkalinity from the load with water alone. This must be done with a laundry sour.

LAUNDRY SOUR/BLUE

A laundry sour is an acid that is safe to use on fabrics. It should be added to the last rinse to neutralize remaining alkalies and to dissolve iron and other metallic salts which cause rust or a yellow discoloration. If left in fabrics, an alkali causes odors and discoloration after drying.

Another reason for using a sour in the last rinse is that it removes sodium bicarbonate, normally in rinse water. Even though all the alkalinity is rinsed out, the sodium bicarbonate remains. It is not injurious to fabrics in itself; but when subjected to the heat of flatirons, presses, and flatwork ironers, it is converted to sodium carbonate which is quite alkaline and in sufficient concentration can cause injury to fabrics.

Souring also decomposes any oxidizing bleach left in a load, prevents discoloration, and helps to sterilize the clothes. In addition, sour sets acid dyes often used in bright colored fabrics, and preserves the tensile strength of fibers. Sours also remove rust stains.

There are many different laundry sours of varying strength, including acetic acid, fluorosilic acid, hydrofluoric acid, and several types of fluoride (ammonium, sodium acid, and sodium silico). Fluoride is generally used. The sour recommended for use is combined in the powdered form with powdered blue. (NSN 7930-00-300-0119.)

At present, your ship's laundry stocks the combined sour and blue powder. The recommended amount of this sour per 100 pounds of wash is prescribed by the formula used. (Refer to Navy Formulas.)

Remember, oversouring is uneconomical and damages fabrics. Oversouring can cause clothing to stick to the press heads and flatwork ironer rolls. On the other hand, undersouring gives poor color because of incomplete neutralization of the alkali.

STARCHING PROCESS

Starch is applied to wearing apparel and other linens to give them body, smoothness, and an improved appearance. Only cotton fabrics should be starched in the ship's laundry. DO NOT starch synthetic and synthetic-blend fabrics. Work clothes should not be starched.

HOW TO APPLY STARCH

Starching is usually done in the washer. The machine does an excellent job. Occasionally, small loads or a few pieces of laundry can be hand-dipped in a separate container.

The amount of starch required depends upon the amount of starch desired in a load or article. Use the amount recommended by the formula used.

For starching shirts with the washer, follow the procedure outlined below.

1. Do not drain the sour/blue bath. Reduce water to a low level with the water at 120°F.

Add the proper amount of starch. At one time white and colored shirts were starched separately, but experience has shown that they can be satisfactorily starched together.

2. Run the machine 6 minutes, long enough to allow the starch to penetrate the shirts.
3. Drain the starch from the machine while it is running, to prevent the starch from settling on the load.
4. If you wish to remove starch from the bodies of shirts, raise the water level at the end of the starch run to 8 or 10 inches and then dump it immediately. The collars and cuffs, since they have two or more layers of material, will retain the starch.

SOFTENERS AND ANTI-STATS

Softeners are used to give a softness to fabrics and to reduce static buildup (clinging), that develops on synthetic and synthetic-blend fabrics during the drying cycle. In addition, Bureau of Medicine and Surgery specifies the use of anti-stats in laundering of linens to be used in medical/dental facilities aboard ships and at shore installations. A laundry rinse additive that meets the requirements for good anti-static properties is currently not available as a standard stock item, although specifications are being drafted.

CHAPTER 5

EXTRACTING AND DRYING

As you learned in chapter 4, the combination washer-extractor has a special motor and a clutch arrangement for extracting water from washed clothes. In addition to the washer-extractor illustrated in chapter 4, two additional representative models installed on board ships of the active fleet are shown in figures 5-1 and 5-2.

As you'll learn in chapter 6, flatwork can be ironed in the damp state directly from the washer-extractor after the extracting cycle has been completed. For satisfactory finishing of wearing apparel and some other articles, however, the extracting cycle leaves too much moisture in these materials. The machine used in the ship's laundry to remove the amount of moisture necessary from different types of materials to ensure good finishing is called the tumbler-dryer.

This chapter discusses the extracting cycle of a washer-extractor and the use of the tumbler-dryer to remove moisture from laundry.

Pertinent information concerning causes of dryer-associated fires, namely, the combination of self-heating materials and high drying temperatures will also be discussed.

EXTRACTING

The length of extracting cycles is important. If the extracting time is too short, the clothes will be too damp for effective drying in the tumbler or on the presses, and production will be delayed. If the extracting time is too long, the garments will reach the pressing units too dry for proper finishing. Production is again delayed because the operator must spray the garments with water to redampen them. Excessive extracting and drying cause hardset wrinkles which require the operator to use more time in straightening out items before pressing them.

Extracting time depends upon many factors, important ones being atmospheric conditions, the type of work handled, and the capacities of the washer-extractors.

Synthetics and synthetic-blend items, particularly those of permanent press, that are to be tumble dried should be given a light extraction. Light extraction will minimize wrinkles. The automatic timer programs the extraction cycle automatically. However, when you are manually operating a washer-extractor, you should use the slowest and shortest extraction cycle possible.

One representative washer-extractor model reduces moisture content in a load to 44 percent in only 2 minutes for polyesters, 5 minutes for polyester blends, and 10 minutes for cottons.

Follow the formulas discussed in chapter 4 of this manual for extracting cycles of various types of materials.

TUMBLER-DRYERS

A battery of tumbler-dryers is illustrated in figure 5-3. These have 37" x 30" baskets with a capacity of 50 pounds each. There are many different sizes of tumbler-dryers. They can be used to dry the new synthetic or synthetic-blend fabrics—clothing, uniforms, linens—wrinkle free.

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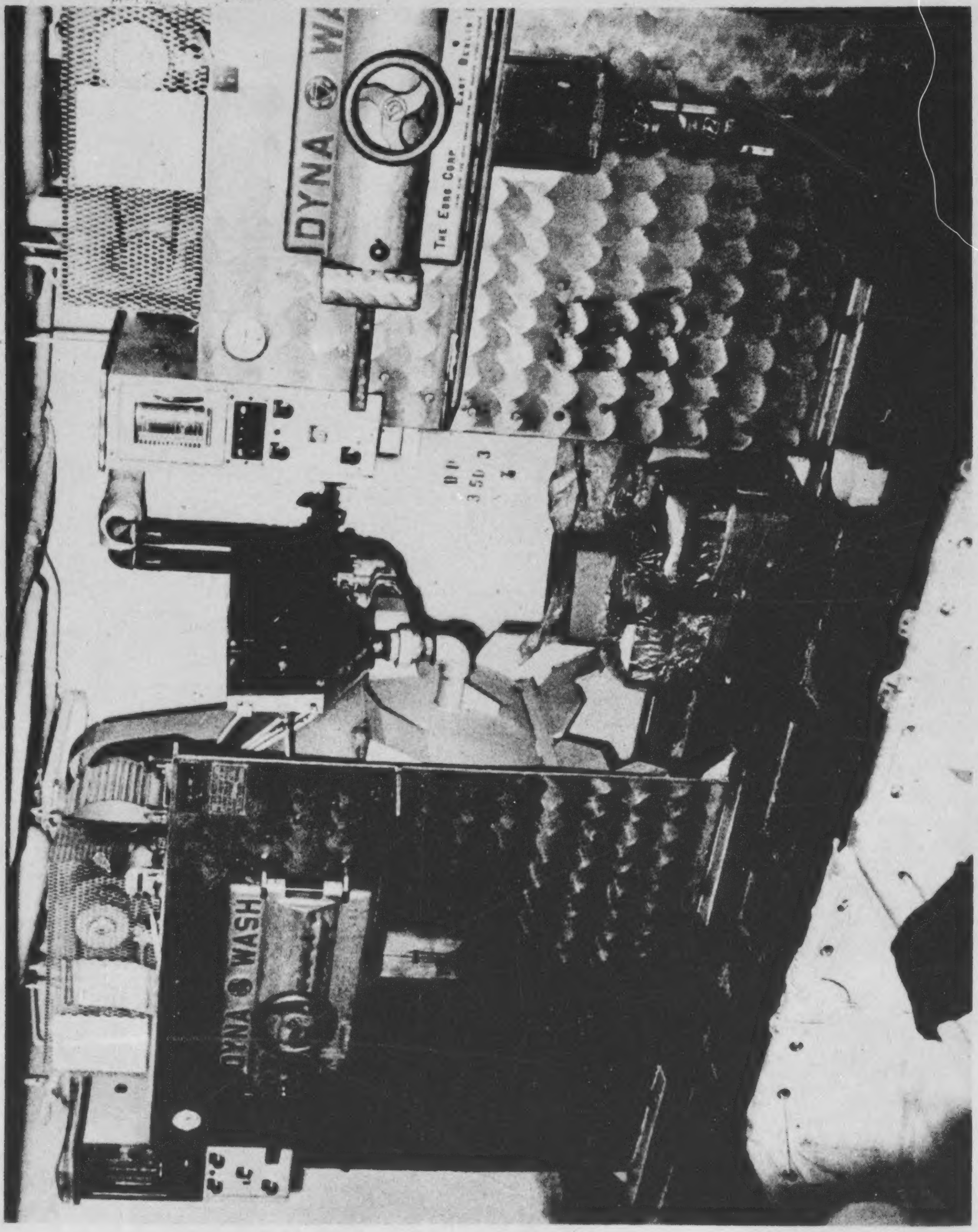
DYNA WA
The Ebco Corp
DYNA WASH

Figure 5-1.—Combination washer-extractor, 75-pound capacity.

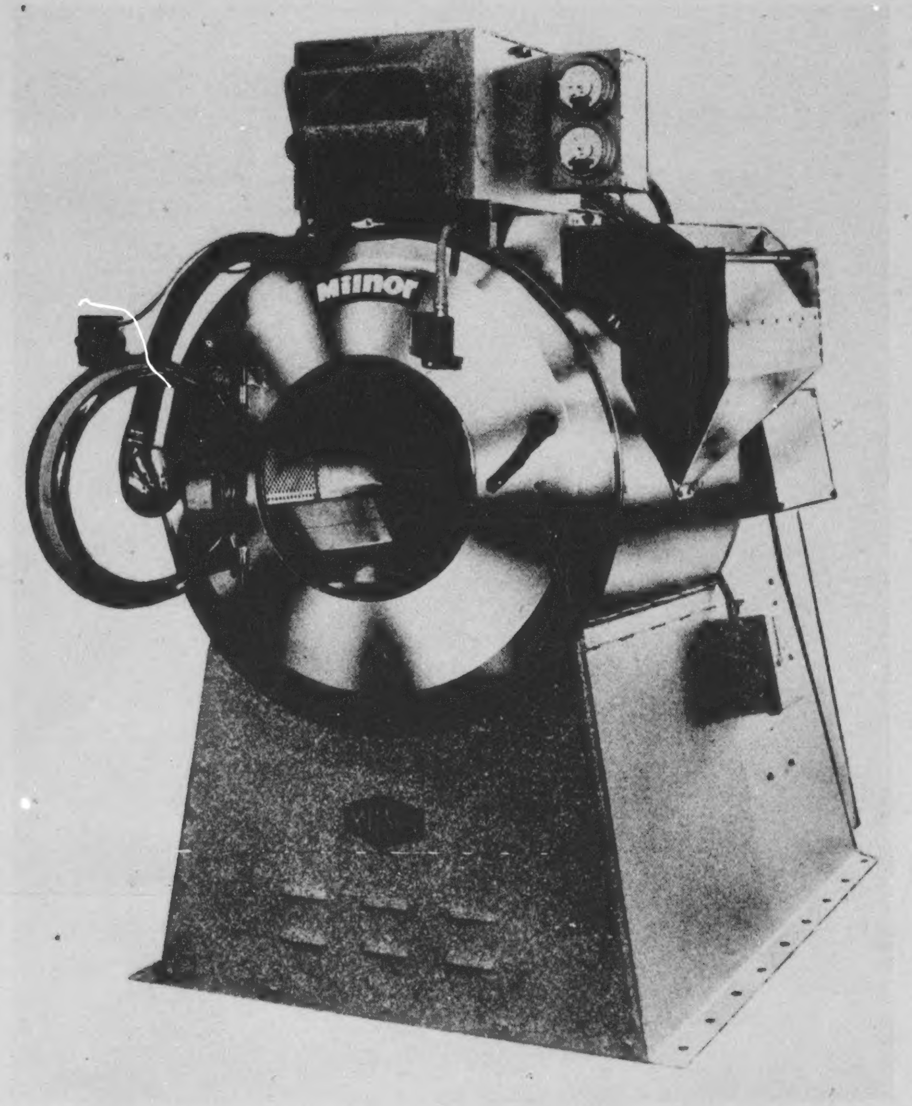

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Figure 5-2.–Combination washer-extractor, 60-pound capacity.

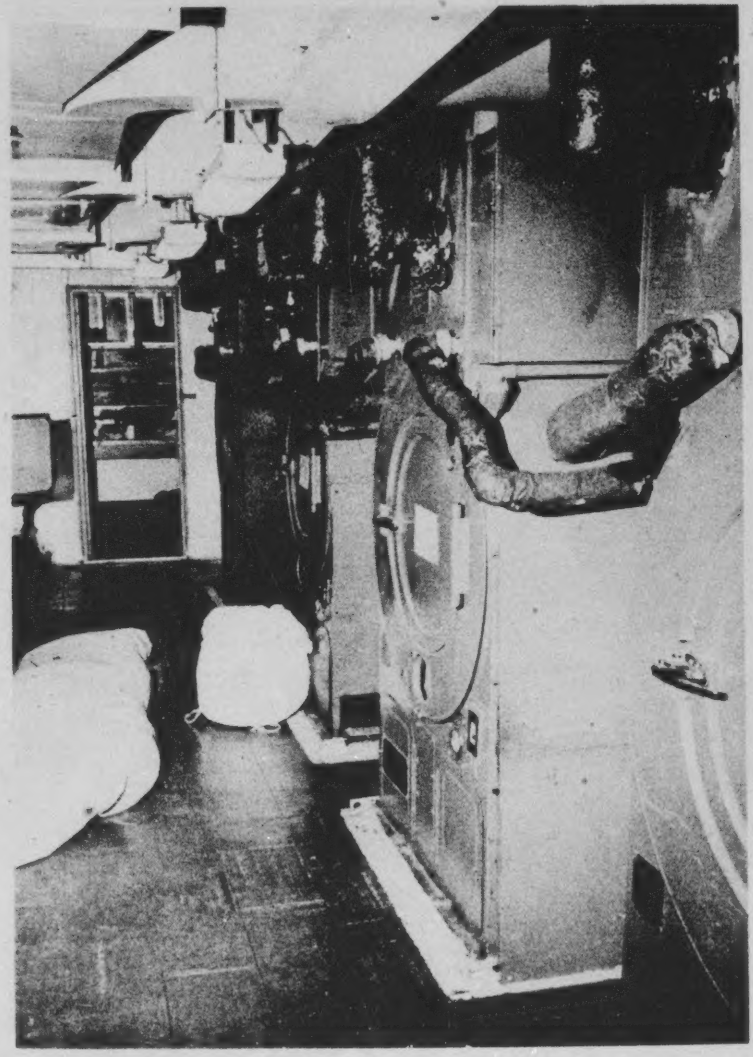

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Figure 5-3.—Battery of drying tumblers.

Additional finishing is required only if wrinkles were set into the garments during washing and extracting. The tumbler-dryer illustrated in figure 5-4 is a representative model of those presently being installed on board Navy ships. The model illustrated in figure 5-4 gives the operator the option of using a cooling cycle on synthetics to avoid heat-set wrinkles. This feature also enables the operator to cool down dryer loads to minimize combustion hazards.

In figure 5-5, the door of the tumbler is open, and part of the perforated basket can be seen inside. A laundryman is seen unloading the tumbler. Note the steam lines near the top of the machine. Each steam line has a valve that

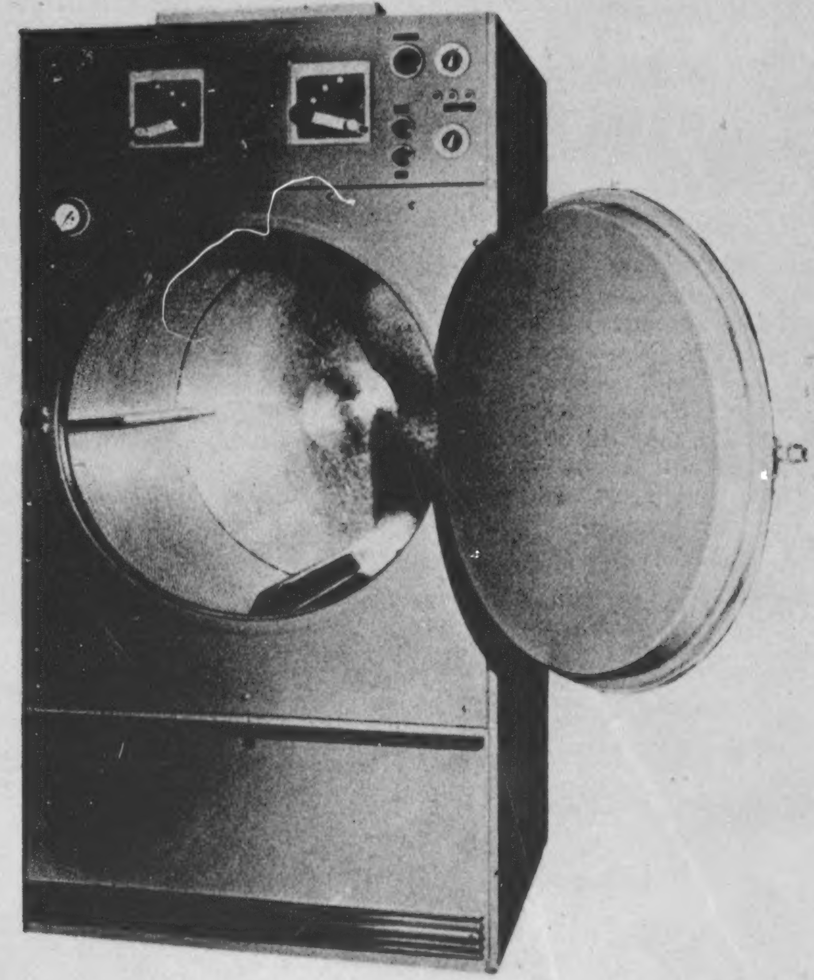

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Figure 5-4.–Tumbler-dryer, 50-pound capacity.

you can open or close to control the amount of hot air admitted to the basket at a specific time.

Each drying tumbler has an exhaust fan enclosed in the bottom of the machine. This fan exhausts air from the tumbler enclosure, and outside air then rushes through the open sides of the heat coil box, where it is heated by the steam pipes. It then enters the basket through the perforations and dries the clothes. The exhaust fan removes the air from the basket and forces it out through an exhaust duct.

TIMER

The tumbler-dryer has a timer that eliminates guesswork in drying. The operator can set the timer for the desired time for a particular load. A signal indicates when the cycle has elapsed. Figure 5-4 illustrates a tumbler-dryer that is equipped with a cool-down setting.

LINT FILTERS AND SCREENS

Old-type tumbler-dryers have large lint screens in the back of the dryer housing. Because of their size, these lint screens are rather difficult to handle and clean. New-type dryers have lint screens in the front, making them easier to remove and clean. The new dryers also use a secondary lint filter in the exhaust line (a sleeve-type unit). All lint filters and screens should be checked every two hours each shift and cleaned.

Figure 5-6 shows a laundryman replacing the lint screen after it has been cleaned. Removable lint screens can be cleaned with a stiff bristled brush.

Figure 5-7 shows a laundryman cleaning the screen of another type of machine. He is turning the handle connected to a rod of the same length as the screen. Several adjustable brushes as long as the rod are attached to it. As the operator turns the handle on the rod, the brushes pass over the lint screen and remove the lint.

Proper cleaning of filters and screens eliminates airflow restrictions which increase the time for drying each load and create possible fire hazards.

DUCTS AND VENTS

Lint debris and buildup in the ducting impedes air flow. Ducts which have long runs

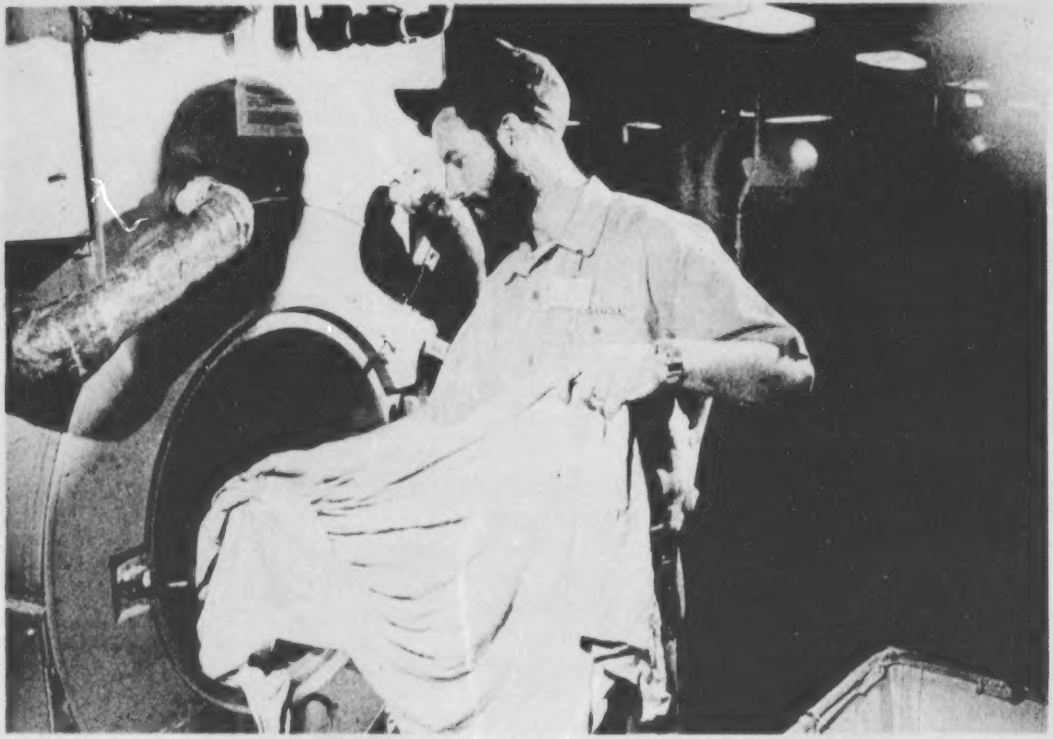

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Figure 5-5.—Laundryman unloading a tumbler-dryer.

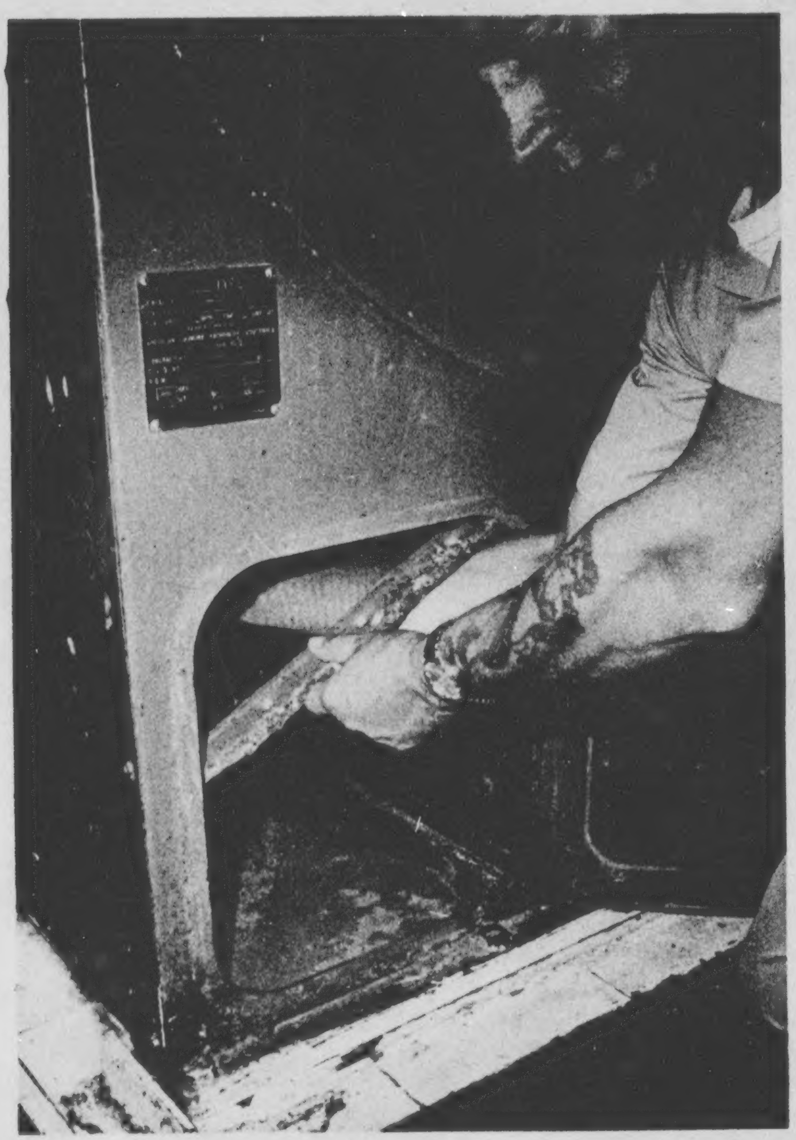

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Figure 5-6.–Laundryman replacing a cleaned lint screen.

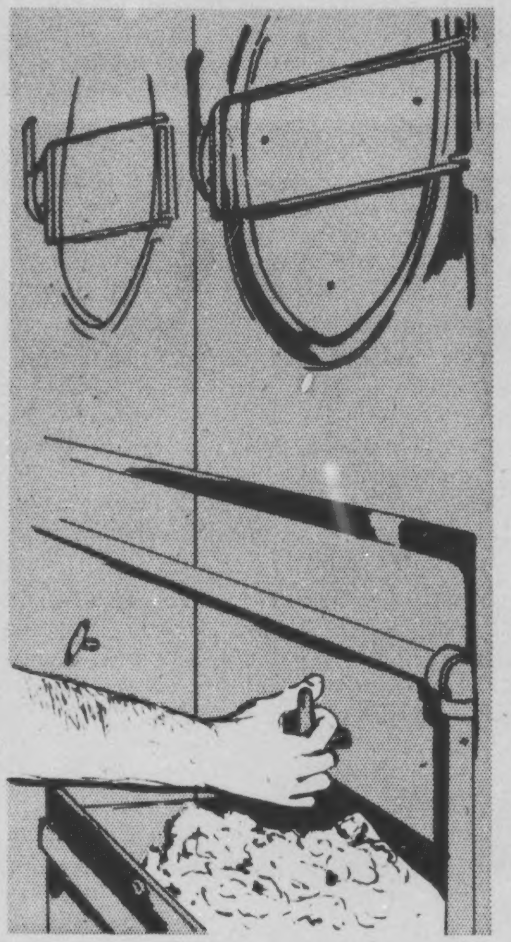

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Figure 5-7.—Laundryman cleaning a lint screen.

and elbows attract lint settling and buildup which create back pressure and a fire hazard. Inspection and cleaning on a monthly basis are required.

STEAM COILS

The configuration of steam coils as heat exchangers makes them collectors of lint and dirt, which slows down the transfer of heat and reduces air flow. Steam coils should be examined daily for the presence of lint; any lint present must be removed.

TUMBLER-DRYER FIRES

Before we get into the actual operation of the tumbler-dryer, let's discuss the potential fire hazards involved in drying clothing and other textile materials in standard shipboard tumbler-dryers.

As previously mentioned in chapter 2, the principal cause of shipboard laundry fires is spontaneous combustion of residual soil in clothing (particularly paint and drying or edible oils) and/or polymeric elastic waistband materials.

Because of the number of fires that have occurred in shipboard laundries, an investigation was conducted to (a) establish the materials and conditions that could cause ignition in laundry loads consisting of commonly worn fabrics, washed and dried by usual methods in standard shipboard laundry equipment and (b) develop the necessary guidelines to prevent recurrence of similarly initiated fires.

The search for causitive factors was concentrated on the fabrics used in Navy apparel, soils, laundering equipment and materials, and on the methods and practices of shipboard laundering and drying. It was speculated that one or more of the newer synthetic fabrics might have ignition temperatures significantly lower than the older natural fabrics; that some residual soils or laundering agents might spontaneously ignite; or that the solution might be found in current shipboard laundering-drying practices. To this end, the following were investigated:

- Ignition temperatures of fabrics used in Navy clothing.
- Tendency of fabrics contaminated with cooking fats and other typical soils to undergo self heating.
- Susceptibility of laundering agents to spontaneous heating.
- Susceptibility of elastic waistband material to spontaneous heating.

- Ignitability of laundry loads under simulated tumbler-dryer conditions.
- Design and operation of shipboard laundry tumbler-dryers.

MATERIALS INVESTIGATED

FABRICS.–The materials used for naval clothing that were investigated include: cotton, linen, silk, wool, acetates, acrylics, nylons, polyesters, and blends of these. Plain weave, preshrunk, permanent finish cotton fabric, U.S. made and marketed, was used in spontaneous heating and dryer fire tests.

ELASTOMERS.–Natural and synthetic rubbers: elastic waistbands from new and used men's shorts, both Navy issue and U.S. made and marketed brands; and woven elastic fabric in the form of waistband webbing purchased from local drygoods stores.

SOILS.–The following soils, known to be or suspected of being subject to spontaneous heating, were selected for investigation.

Edible Oils.–(Cooking fats/salad oils). Cottonseed oil, corn oil, lard oil, olive oil, peanut oil, and "cooking oil." The latter is a blend of corn, cottonseed, and soybean oils.

Paint and Paint Vehicles.–Formula-20 paint and nonvolatile vehicle, Formula-30 paint and nonvolatile vehicle, and linseed oil.

Fuels.–Navy Special Fuel Oil (NFSO), Navy Distillate (ND), Diesel Fuel Oil (MIL-C-16884), Jet Fuel (JP-5).

Lubricants.–Navy Symbol 2190 TEP and 9250 lubricating oils, General Purpose Grease (MIL-G-10924).

LAUNDRY CHEMICALS.–Both standard Navy stock and U.S. made and marketed products in common shipboard use were tested and evaluated.

TEST RESULTS

Tests showed that none of the textile fabrics considered self-generating ignite at temperatures below 393°F. With the exception of linseed, none of the edible, fuel, paint, or lubricating oils spontaneously heated at 212°F. Cotton test strips soaked with edible or paint oils self heated at 266°F. Cotton test strips saturated with the same oils, then laundered, after which they showed no evidence of soil other than perhaps a faint characteristic odor, also spontaneously heated at 266°F. Of the lubricants and fuels tested, only JP-5 showed any tendency to self heat.

One organic bleaching compound and a synthetic detergent, both U.S. made and marketed, spontaneously heated at 338°F. None of the other washing agents self heated at any of the test temperatures (212°, 266°, and 338°F); however, cotton sprinkled with inorganic bleach (HTH) was grossly deteriorated at temperatures above 266°F.

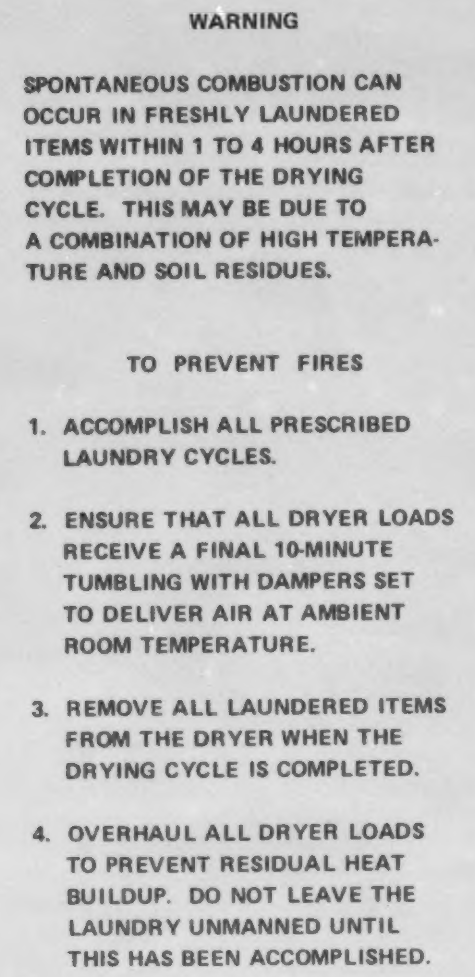
One of the new elastic webbings and all six of the used elastic waistbands tested, spontaneously heated at 338°F. Only one used waistband spontaneously heated at 266°F. No new or used elastics self heated at 212°F. A fire started in a simulated laundry dryer load containing a core of used elastic waistband at 338°F.

Fires were produced in simulated laundry dryer loads containing both grossly and residually soiled test specimens. The fires occurred within one-half hour to three hours at a test temperature of 266°F. Fire initiating mixtures included both edible and paint oils.

SHIPBOARD EQUIPMENT

Make sure you know your equipment. Investigations of shipboard fires have revealed the following conditions in laundry tumbler-dryer safety devices:

- Have thermometers that do not indicate temperatures above 220°F, although the equipment can be operated above this temperature.
- No automatic temperature control.
- No automatic timing device to control drying time.



WARNING

SPONTANEOUS COMBUSTION CAN OCCUR IN FRESHLY LAUNDERED ITEMS WITHIN 1 TO 4 HOURS AFTER COMPLETION OF THE DRYING CYCLE. THIS MAY BE DUE TO A COMBINATION OF HIGH TEMPERATURE AND SOIL RESIDUES.

TO PREVENT FIRES

1. **ACCOMPLISH ALL PRESCRIBED LAUNDRY CYCLES.**
2. **ENSURE THAT ALL DRYER LOADS RECEIVE A FINAL 10-MINUTE TUMBLING WITH DAMPERS SET TO DELIVER AIR AT AMBIENT ROOM TEMPERATURE.**
3. **REMOVE ALL LAUNDERED ITEMS FROM THE DRYER WHEN THE DRYING CYCLE IS COMPLETED.**
4. **OVERHAUL ALL DRYER LOADS TO PREVENT RESIDUAL HEAT BUILDUP. DO NOT LEAVE THE LAUNDRY UNMANNED UNTIL THIS HAS BEEN ACCOMPLISHED.**

Figure 5-8.—A "Prevent Laundry Dryer and Hamper Fires" Placard.

- No automatic cool-down cycle.
- No fire sensing and smothering device.

When the above conditions exist on board your ship, be extra careful when operating the tumbler-dryer.

The information summarized in figure 2-13 (in chapter 2), indicates that the principal reason for shipboard laundry dryer fires was operator error. Operator error was attributed to lack of knowledge, poor judgment, carelessness, inattentiveness, and fatigue. Figure 2-13 shows that three fires occurred in dryers with steam left on, and six occurred after the steam had been secured. In at least three, and possibly all twelve, of the dryer incidents there was no cool-down cycle following the drying.

A "Prevent Laundry Dryer Fires" placard should be posted on the front of each dryer. (See fig. 5-8.) Placards are available through the Supply System under NSN 0177-00-226-5300. Check the placard that is mounted on each dryer in your ship's laundry to see if it reads as indicated in figure 5-8.

OPERATING THE DRYING TUMBLER

Before using a newly installed dryer, run it several minutes to remove dirt and dust from the interior. Then clean the basket of foreign matter and/or oil by filling it with clean rags and running the machine for about 5 minutes. It is then ready for use.

The procedure for operating a drying tumbler is as follows:

1. Open the damper to the exhaust line.

2. Close the lint box door (on old-type machines).

3. Open the steam return line valve.

4. Crack the steam inlet valve to heat the machine slowly. If too much steam enters the cold steam line, the metal pipes expand rapidly and crack loudly; this results in harmful vibrations to lines and equipment.

5. After the machine is thoroughly heated, completely open the steam inlet valve.

6. Load the basket with the correct weight of clothes. An overload strains the machine and blocks the passage of air through the clothes, extending the normal drying time. An underload allows the air to pass through the clothing too fast, resulting in inefficient operation of the machine. A proper load creates enough of a baffle, or hinderance, to the passage of air to result in adequate drying during the time allowed.

7. Close the basket door.

8. Set the timer for approximately 20 minutes (50-pound dryer). Drying time depends upon steam condition, weight and texture of load, and the amount of moisture left in the load after it was extracted. Standard tumbler performance should not exceed 1 minute per pound (dry weight). Late model machines can dry almost 2 pounds of clothes in a minute.

9. Turn the manual switch on. The motor will start.

10. When the timer alarm sounds, open the door and remove the load.

CAUTION:

- On dryers without a cool-down cycle, tumble all dryer loads for 10 minutes with dampers set to deliver air at room temperature or until a temperature of 120°F is reached.

- To avoid possible combustion, remove all laundered items from dryers upon completion of drying cycles.

- Man laundry spaces after the last dryer is emptied to ensure no residual buildup of heat in filled bags/hampers. Clothes should be stored loosely to allow air to circulate in and around them.

- Do not put flammable items such as rubber, plastic-backed, or padded items in the dryer. These items should be air dried.

DRYER FINISHING OF SYNTHETIC AND SYNTHETIC-BLEND CLOTHES/LINENS

Tumble drying of washed synthetic and synthetic-blend clothes and linens, properly carried out, can minimize and/or eliminate the need for pressing of the items.

For those ships not having permanent press settings (with cool-down features) or tumbler-dryers, additional tumble drying precautions should be taken:

1. In all instances the tumbler-dryer must not be overloaded in order to allow adequate tumbling action for wrinkle removal. Three-quarters (3/4) of the rated dryer capacity is recommended.

2. Hot tumble drying temperatures should not be used. Exhaust-air temperature should be set at a medium setting (between 140°-160°F). Drying time varies with the nature and size of the load, but items containing a synthetic or high percentages of synthetics in blends dry much faster than similar 100 percent cotton items. Items should not remain in the tumbler when it is not in motion.

3. For dryers without the cool-down feature, tumble drying for an additional 10 minutes without heat will cool down the items and avoid setting new wrinkles.

4. Permanent press, synthetic, and synthetic-blend wearing apparel and linens, when removed from the dryer immediately after cool down and either placed on a hanger or folded, should be suitable for use without ironing. Processing of linens in this manner can help cut down the work load for flat work ironers.

CARE AND MAINTENANCE OF DRYING TUMBLERS

Always keep your drying tumbler free of lint. Lint is a fire hazard. Besides, clothes will not dry properly unless the lint screen is clean enough to allow free passage of air through the machine.

If you have a dryer with a self-cleaning screen, check it every time you remove lint from the canvas to determine how well the brushes are doing the job. When they become worn, they require adjustment to make them strike the screen with enough force to remove lint. Eventually screens require replacement.

Small screens on dryers without self-cleaning screens require manual cleaning rather frequently. Experience in operating the machine under normal conditions tells you how often to clean the lint screen. It is also a good idea to clean the lint box each time you clean the screen.

Use a vacuum cleaner or a compressed air jet to remove lint deposits from heater chambers and air passages in the dryer. If lint is left to accumulate, spontaneous heating may result, or the flow of air will be restricted.

Other maintenance you can perform on the drying tumbler includes the following:

- Checking switches and dampers to determine how well they work.

- Keeping nuts and screws tight.

- Reporting maintenance requirements to your supervisor promptly.

- Checking the tension of drive belts.

Screws, nails, pins, and melted plastic which has solidified will occasionally clog the perforations in the basket mesh creating operating hazards. Baskets should be checked and cleaned daily.

The engineering department should check the tumbler-dryer at regular intervals for accumulations of lint in air passages and the lint box, faulty opening and closing of dampers, leaks in the steam valves or lines, and the general condition of the machine. Engineering personnel should lubricate the tumbler and make major overhauls in accordance with the recommendations of the manufacturer.

TUMBLER-DRYER HEATER COILS

The heater coils of tumbler-dryers are generally arranged in two banks with a separate steam connection to each bank. Shut-off valves are provided on both the inlet and drain side of each bank.

When laundering protective clothing, shut off one bank of heater coils at both the inlet and the drain connection. This reduces the maximum drying temperature, when 100-pound steam pressure is used, approximately 45°F, which will bring the temperature down within a safe operating range. If your ship uses 35-pound steam pressure, the maximum drying temperature will be reduced approximately 15°F, but it will be well within the safe operating range.

DRYING IMPREGNATED CLOTHING

When you are drying impregnated protective clothing, take the following measures to prevent damage to the clothing. Dry impregnated protective clothing carefully, since excessive heat will cause the loss of impregnant. It is important that the temperature of protective clothing be kept no higher that 155°F.

Remove the impregnated protective clothing from the tumbler at once after the drying cycle is completed. Clothing removed from the dryer (overalls and jumpers with hoods) should be separated immediately and folded. Drying may also be accomplished by hanging the clothing on a line, but precautions should be observed against the exposure to direct sunlight.

Impregnated protective clothing should never be ironed or drycleaned. It can normally be laundered three times before its protective qualities become inadequate, but representative samples of the clothing should be tested after each laundering to determine whether it should be reimpregnated.

OPERATING PROCEDURES WHEN DRYING IMPREGNATED CLOTHING

Observe the following procedures when drying impregnated protective clothing in the tumbler-dryer:

1. Close the steam intake valve and the drain valve on one bank of heater coils.

2. Thoroughly clean the lint screens.

3. Close the cold air damper and open the warm air damper on open-end tumblers. Set the dampers on side-loading tumblers so that air will be recirculated.

4. Without any load in the cylinder, operate the tumbler for 15 minutes admitting steam to only one bank of heater coils and ensure that the temperature does not exceed

155°F. Adjust the dampers if necessary. When this condition is met, the tumbler is ready for operation.

5. After the clothing has been washed and extracted, place a normal load in the tumbler and operate the tumbler until the load is satisfactorily dry, but in no case should the temperature of the exhaust air exceed 155°F. Allow the protective clothing to cool completely before packing or storing.

CHAPTER 6

FLATWORK IRONING

The main items of laundry flatwork aboard a Navy ship are bed linens and tablecloths. For pressing these, a flatwork ironer is installed on ships that have sufficient requirement for this piece of equipment. On this ironer (sometimes called a mangle) the flatwork is ironed damp just as it comes from the washer-extractor. Such things as handkerchiefs, hand towels, aprons, undershirts, and white trousers can also be finished on the flatwork ironer.

Items of laundry flatwork are currently being manufactured from synthetic and synthetic/cotton-blend fabrics. These items can be successfully finished without pressing in a tumbler-dryer. Use of dryers in this connection can reduce the press deck load where an ironer is not available. Where an ironer is available, its use will reduce the drying tumbler workload and produce a better finish than rough drying.

The use of the flatwork ironer lightens the work of the drying tumblers and produces a better finish than rough drying.

On ships without flatwork ironers, some of the flatwork, such as the table linen, is pressed on a laundry press of the type described in chapter 7. The rest of the work is rough dried.

You will probably serve at some time on a ship that has a flatwork ironer, and therefore are expected to know how to operate one correctly. As with other machines in the laundry, you should know what care and maintenance is your responsibility and what jobs are performed by engineering personnel. This chapter covers correct procedures for operation of the ironer and for the maintenance tasks that are your responsibility. It also covers the safety precautions that will help you avoid breakdowns and accidents.

Flatwork ironers currently used in ships' laundries are not all exactly alike, but they all work on the same principle. This chapter describes the ironer and its operation and maintenance in general.

DESCRIPTION OF THE IRONER

The type of flatwork ironer used on Navy ships consists of a steam-heated cylinder against which the flatwork is pressed by means of three padded pressure rolls. The work is carried into the ironer on feed ribbons that lead the work over the cylinder. At the rear an apron or ribbon presses the work against the under side of the cylinder and returns it to the front. Steam to heat the cylinder is provided by the ship's steam line, and the motor is electrically driven.

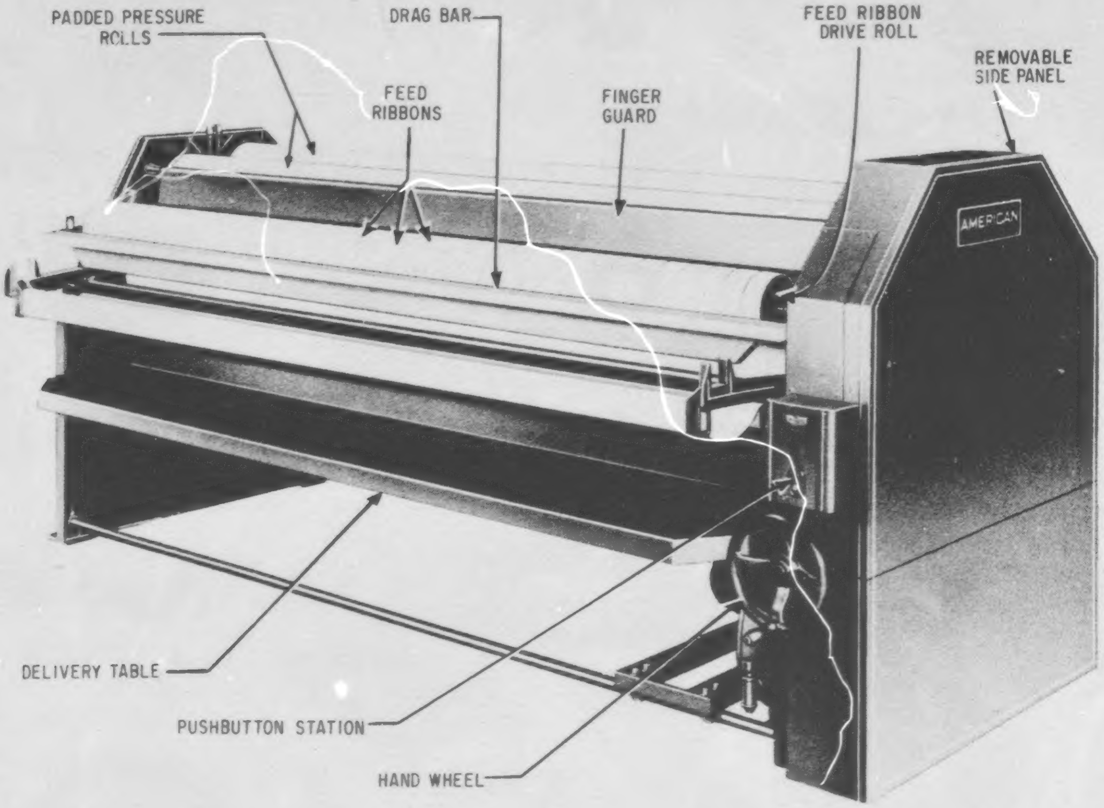
The ironer parts with which you are mainly concerned are labeled as shown in figure 6-1. Other parts, not so clearly seen and not labeled, are the motor, which is below at the right, and the parts housed on the two frames that support the cylinder and rollers. The drive gears are housed in the right frame, and the left end has a combined inlet and outlet steam valve. The condensate (steam reconverted to water) is collected by a trap connected to the outlet part of the steam joint.

Maintenance of the motor, gears, and steam connections is the responsibility of engineering personnel; and if you suspect that adjustment or repair is needed in these areas, you should notify the engineering department. As the operator, you will be responsible for following correct operating procedures and for making adjustments to roll pressure, changing the feed ribbons, removing and replacing roll padding and covers, changing and adjusting the apron, and keeping the cylinder, padded pressure rolls, and apron clean. We will, therefore, examine those parts of the machine more closely.

The cylinder is 16" or 18" in diameter. The size of the machine is designated by the length of the cylinder, which represents the width of material the machine will take without folding. Currently, ironers used on Navy ships have either 50", 60", 75", 85", or 100" cylinders.

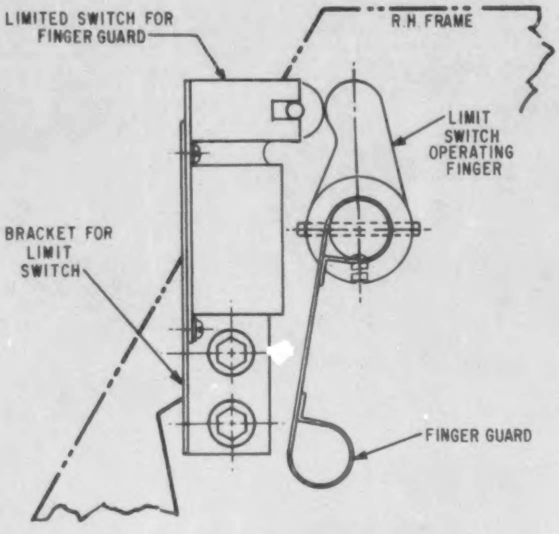
The three padded pressure rolls, mounted above the steam cylinder, are 6 3/8" in diameter when padded. They have spring pressure adjustments at each end. Each padded pressure roll operates at a different pressure, the front roll having the greatest pressure and the rear roll the least. The large handwheel at the right is for increasing and decreasing pressure on the rolls.

Feed ribbons are spaced close together so as to carry all parts of a large piece of work like a sheet or bedspread evenly into the ironer. As a protection, flatwork ironers have a finger guard that prevents the hands of the operator from getting near the padded pressure rolls. This guard also prevents damage to work through careless feeding. If anything thicker than flatwork touches the guard, the limit switch on



22.21X

Figure 6-1.—Flatwork ironer.


LIMITED SWITCH FOR FINGER GUARD
R.H. FRAME
LIMIT SWITCH OPERATING FINGER
BRACKET FOR LIMIT SWITCH
FINGER GUARD

22.90

Figure 6-2.—Finger guard limit switch.

the right frame opens automatically and cuts off current to the motor. The limit switch is illustrated in figure 6-2.

The apron or ribbons pick up the work as it leaves the last of the three padded rolls, and carries the work back beneath the steam cylinder to the front of the ironer. See figure 6-3.

OPERATING THE FLATWORK IRONER

Men who operate a flatwork ironer should have the manufacturer's instruction manual available. You should break out the manual and study it before you operate any ironer for the first time, and afterwards keep it at hand for reference.

PREPARING A NEW IRONER FOR USE

Before you use a new ironer, you must remove the protective coating placed on the cylinder by the manufacturer. To do this, run a piece of heavy paper (absorbent) into the machine under light roll pressure. Stop the machine and turn on the steam until the coating melts and is absorbed by the paper. Then remove the paper and wipe the remainder of the coating from the cylinder with a clean rag. Do this before the cylinder cools. Clean the apron and padded pressure rolls of all foreign material that may have collected in transit.

The engineering department should check and adjust the new ironer before it is used for routine work.

Before each period of use, make sure that the ironer is thoroughly clean. When you finish using it, you should leave it clean, but check it again the next time you use it to be certain that nothing has gotten in that would soil the flatwork.

HEATING THE IRONER

A flatwork ironer should always be heated before you start to feed it. Heating of the cylinder is done while the padded pressure rolls and apron are not in contact with the cylinder.

Heating the Cylinder

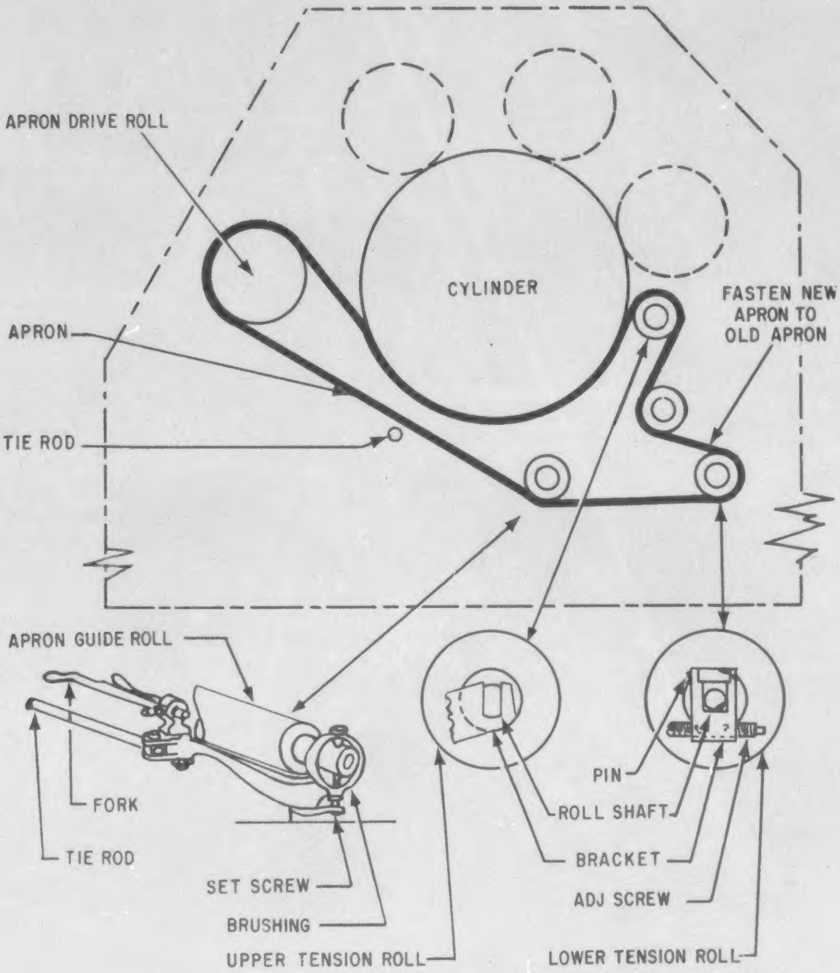
1. Heat the cylinder slowly. Allow 45 minutes from the time you start heating until the machine is ready to operate.

2. Open the valve bypassing the steam trap, then partially open the main steam valve to heat the cylinder slowly. If you turn the steam on full force while the cylinder and machine are cold, the sudden expansion of the cold cylinder could cause it to warp or split. The frame of the ironer where the steam line is connected could also be damaged by excessive vibration caused by sudden expansion of the cold metal.

3. Leave the bypass valve open for 30 minutes. Then close it and fully open the main steam valve. The cylinder is now hot and the full force of the steam will not damage it.

Heating the Rolls

When the cylinder is heated, you are ready to heat the padded pressure rolls. Turn the handwheel clockwise to apply light pressure. Then depress the start button and run the ironer


APRON DRIVE ROLL
CYLINDER
FASTEN NEW APRON TO OLD APRON
APRON
TIE ROD
APRON GUIDE ROLL
FORK
TIE ROD
SET SCREW
BRUSHING
UPPER TENSION ROLL
PIN
ROLL SHAFT
BRACKET
ADJ SCREW
LOWER TENSION ROLL

22.23

Figure 6-3.—Diagram for replacing apron on flatwork ironer.

empty for about 15 minutes to heat the padded pressure rolls thoroughly.

DO NOT START FEEDING UNTIL THE CYLINDER AND PADDED PRESSURE ROLLS ARE THOROUGHLY HEATED.

PRESSURE CONTROL

Turning the handwheel clockwise brings the padded pressure rolls in contact with the cylinder and at the same time raises the apron into operating position. The same handwheel clears the padded pressure rolls and the apron from the cylinder when turned counterclockwise.

Turn the wheel carefully, applying just enough pressure to produce a desirable finish. Too much pressure will damage the padding of the pressure rolls and cause undue wear on the bearings and excessive strain on the driving mechanism. Once you determine the right amount of pressure for good work, you can set the wheel at the same point for almost all your work.

The pressure should be released whenever the machine is to be idle for 10 minutes or longer. Otherwise, heat from the cylinder will scorch the roll padding and the apron.

NEVER RUN THE MACHINE WITH THE PRESSURE OFF. To do so will damage the apron.

FEEDING THE IRONER

Flatwork comes from the extractor full of wrinkles and must be shaken out by hand before feeding it into the ironer. Two men should handle large pieces, being careful not to pull the fabric too much in shaking. Otherwise, they may tear it. The shakeout serves to prepare work for feeding into the machine, and precludes the possibility of ironing heavy wrinkles or folds into the material.

To facilitate feeding, a quantity of work should be shaken out and laid over the edge of the laundry basket, or on a table within easy reach of the operators. If you are using a small ironer that requires folding of large pieces, shake them out and fold them immediately.

Check on the amount of dampness in the pieces before feeding. The pieces should come out of the ironer dry, and to accomplish this, some adjustment of the extracting time may be necessary. If the pieces are not extracted long enough they will come out of the ironer still damp; and if extracted too long they will come out with a rough, dry appearance. Do not let flatwork sit around in the laundry baskets after it is removed from the extractor. Iron flatwork immediately while it is at the proper stage of dampness, or cover it with plastic or other material to retain a proper amount of moisture.

Feed flatwork into the ironer WRONG SIDE UP, so that the smooth or "right" side comes into contact with the cylinder. This gives a smooth finish to the outside of the flatwork. Fold the smooth side out as the work comes from the machine.

Feeding Large Items

Two men should feed sheets, bedspreads, and other large items into a 75" ironer. See figure 6-4 noting especially the position of the men's hands. In starting the piece through the ironer, each man grasps a top corner with the hand nearest the ironer, stretching the forward edge between them so that it enters the machine straight and smooth. Each man uses his other hand to straighten the front edge as it enters the ironer. After the feed roll ribbons pick up the spread, they use both hand to hold the spread firm and straight as it passes through the ironer. As the spread comes out, the men take it by the edges again and fold it. The ironer shown in figure 6-4 has a safety screen over the padded rolls. This screen can also be installed on the machine shown in figure 6-1.

On the 50" ironer the large flatwork must be folded to pass through. Less pressure may then be necessary, and two passes through the ironer may be required to dry the fabric. On the second pass, turn the piece so that the opposite side comes into contact with the cylinder. Both halves of the side folded out will then have the same shiny finish.

Feeding Small Items

When feeding small articles into the flatwork ironer, use the entire length of the cylinder. If you continually feed small items into the ironer at one or two spots, you will soon wear the padding on the pressure rolls more at these points and your work will come out unsatisfactory. The only way to correct this difficulty is to repad the rolls.

Pressing Items of Uniform

Before feeding trousers into the ironer, release the padded roll pressure enough to allow for the double thickness of the material and for the buttons. Feed the bottom of the trouser legs into the ironer first, smoothing out the upper part as much as possible. Some wrinkles cannot be prevented, but get the garment as smooth as possible. Trousers probably will need to go through the ironer twice to dry them satisfactorily.

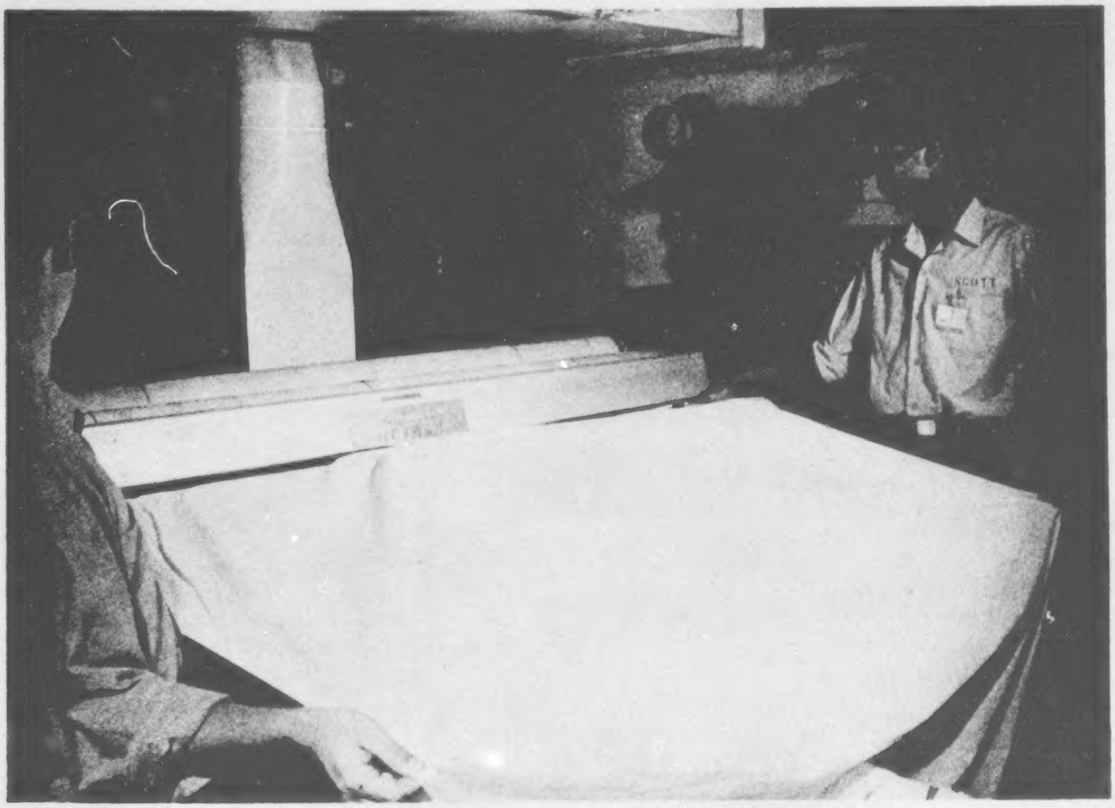


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Figure 6-4.—Laundrymen feeding flatwork ironer.

Using the flatwork ironer to press trousers is, of course, preferable to only rough drying. The presses described in chapter 7 do a much better job.

SECURING THE IRONER

Upon completion of work, stop the motor. Close the main steam valve tight. The bypass valve may be opened to speed the cooling.

When closing down, the padded rolls and the apron should be entirely free of the cylinder. To help preserve the padding of the pressure rolls, a piece of heavy duck may be run into the ironer between all three pressure rolls, the apron, and the cylinder. Run it in before you release the pressure, and then when you next use the ironer, remember to apply pressure before you run the cloth out. Whether you insert the cloth or not, release the pressure before securing the ironer.

CARE AND MAINTENANCE YOU PERFORM

Earlier in this chapter the maintenace tasks of the laundryman were listed. Before starting any of these be sure you know how to do the work. Consult the manufacturer's instruction manual unless you have done the task on this machine recently. Under ordinary circumstances, do not undertake jobs that are the responsibility of engineering personnel.

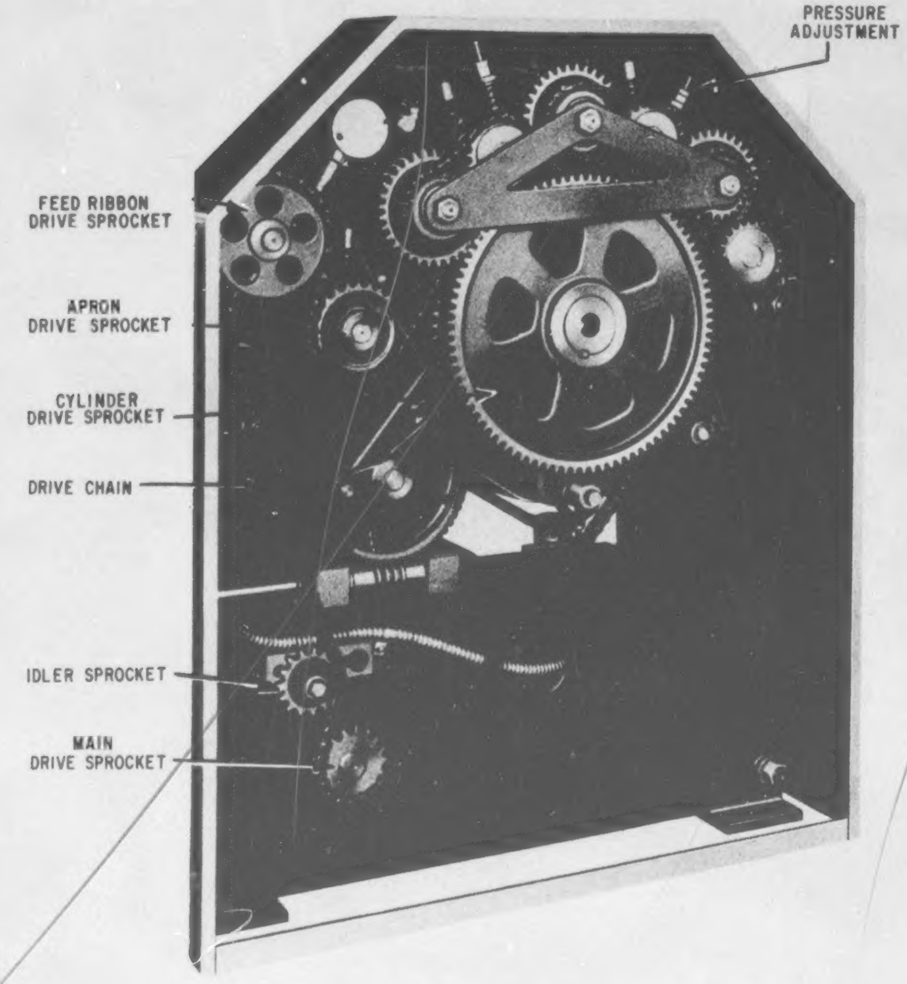

PRESSURE ADJUSTMENT
FEED RIBBON DRIVE SPROCKET
APRON DRIVE SPROCKET
CYLINDER DRIVE SPROCKET
DRIVE CHAIN
IDLER SPROCKET
MAIN DRIVE SPROCKET

Figure 6-5.—Pressure roll adjustments and gears in right-hand frame. 22.24X

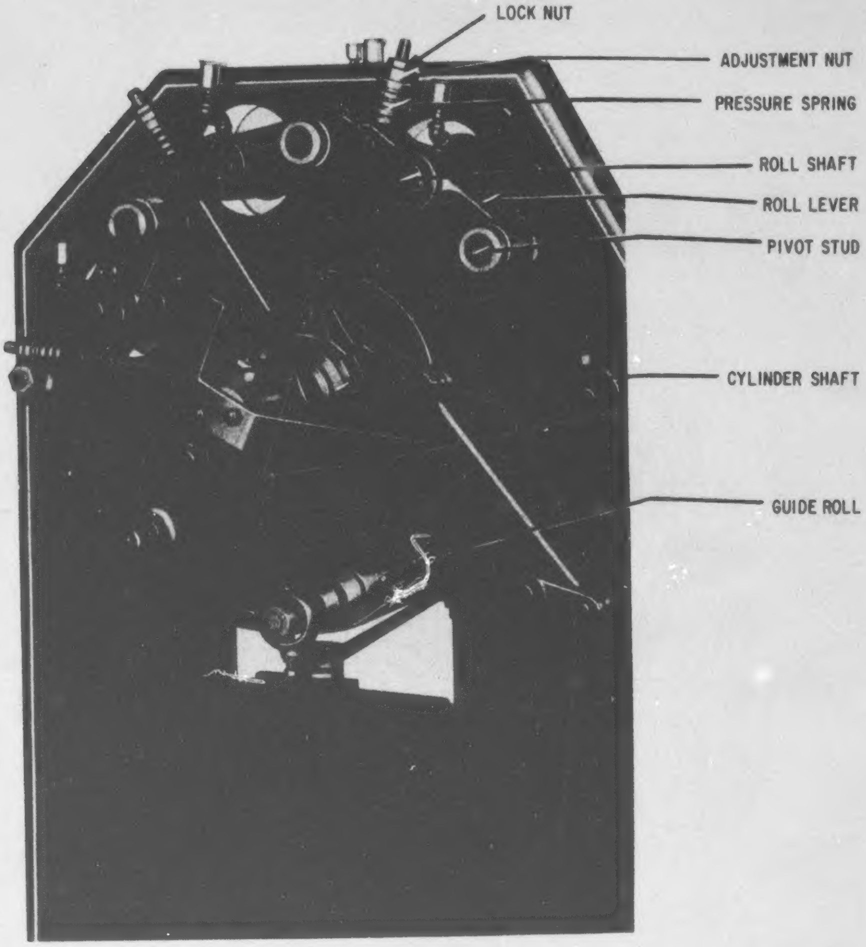
CARE OF STEAM CYLINDER

When cleaning the cylinder, run a paraffined cloth through the ironer about twice a day. Cut a strip of cloth about 3 feet wide and as long as the cylinder. Sprinkle half of the strip generously with powdered paraffin (or shavings of solid paraffin) and fold the other half over it. Then run it through the heated ironer, folded edge first. The cloth can be reused as long as the wax lasts.

CARE AND REPLACEMENT OF THE APRON

After a certain amount of use, the return apron stretches. Remove the stretch by making equal adjustments on both ends of the rolls. Eventually, however, the apron becomes stretched and worn beyond satisfactory use and must be replaced. Figure 6-3 shows you how to replace the apron.

The heavy line running over the apron drive roll, under the cylinder, and over the tension


LOCK NUT
ADJUSTMENT NUT
PRESSURE SPRING
ROLL SHAFT
ROLL LEVER
PIVOT STUD
CYLINDER SHAFT
GUIDE ROLL

22.25X

Figure 6-6.—Mechanism on left-hand frame of flatwork ironer.

rolls is the path of the ironer apron. Change the apron in the manner outlined below.

1. Fasten the new apron to the old one at the point shown in figure 6-3.
2. Cut the old apron.
3. Run the machine long enough to pull the new apron around the rolls.
4. Remove the old apron.
5. Insert wire through the clipper lace on the new apron.
6. Apply pressure to the padded pressure rolls with the handwheel. See figure 6-1.
7. Turn the screws on the apron tension rolls until the tension on the apron is correct. Note the location of the tension rolls in figure 6-3, and the location of adjustment screws. See figures 6-5 and 6-6 for the location of the adjustment screws.

An arrow in figure 6-3 points to the position of the apron guide roll on the ironer. The apron guide roll is directly beneath the cylinder and prevents the apron from getting out of position and shifting laterally across the face of the cylinder.

In newer ironers, ribbons have replaced the apron. The ribbon function and travel path is the same as the apron.

HOW TO REPAD IRONER PRESSURE ROLLS

Change the padding on ironer pressure rolls when it is scorched and burned out, or when resiliency is lost. This can be determined by applying finger pressure to the roll circumference. If an impression cannot be made, the padding is no longer resilient and is in need of replacement. The life of the padding depends on the type of material and the amount of use of the ironer.

The material recommended for repadding ironer pressure rolls of the ironer illustrated in figure 6-1 is given in table 6-1.*

Table 6-1

Article	Quantity	Size
Muslin	3 pieces	45"x 52"
Knitted padding (1/4")	3 pieces	90"x 48"
Muslin	3 pieces	72"x 52"
Apron duck (4-ply)	1 piece	50"x 87"
Duck for bib ..	1 piece	26½"x 50"
Ribbons	19	½"x 35"
Apron drive roll duck (#12) ..	1 piece	21"x 52"

*Ribbons and duck for apron and bib are also included in this list.

Steps in the repadding of ironer pressure rolls are as follows:

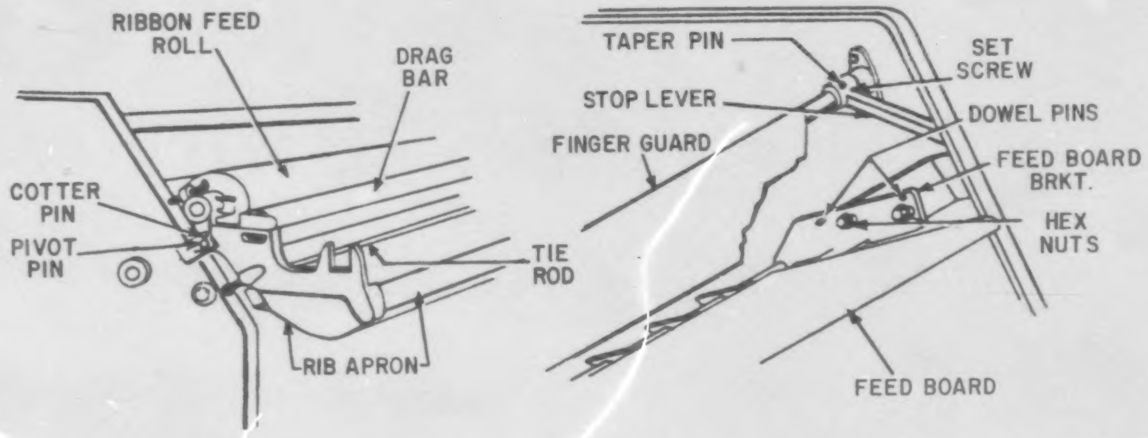
1. Relieve the roll pressure and the apron tension with the handwheel.
2. Remove the worn covering and clean the rolls thoroughly.
3. Lower the cleaned rolls to a position 3/8"above the cylinder.
4. Apply a coat of glue 2" to 3" wide on the full length of the first roll. Then stick one edge of the 45" x 52" muslin binder to the glued portion and wrap it around the roll, in the direction OPPOSITE TO the rotation of the wheel. When put on in this manner, the roll will keep the muslin tight as it runs.
5. Follow the procedure in step No. 4 for the second and third rolls.
6. Apply one piece of the 1/4" knitted padding to each roll. Allow a 12" lap under the muslin binder.
7. Put a 72" muslin top cover on each roll. Allow a 12"lap under the knitted padding.

Tear the muslin binder and remove the selvage to get a straight edge. DO NOT CUT. To prevent wrinkles, carefully feed the covering around the rolls. When the roll covers become discolored or worn, change them without delay.

Fully padded pressure rolls should measure 6 3/8" in diameter. Measure them with a caliper or a steel tape. Release the pressure on the rolls and measure each one in the middle and at each end. If the circumference is approximately 20" for all three measurements, the padding on the rolls is fairly uniform all over. If, however, there is an appreciable difference in the three measurements, you'll have to remove the padding and start over.

After you complete the padding of the rolls, adjust them to uniform pressure in the manner indicated below.

1. Turn the handwheel counterclockwise to raise the padded pressure rolls clear of the cylinder. See figure 6-1.
2. Remove the cover to the housing on the right frame of the ironer. (See fig. 6-5.) Then loosen the nuts on all spring mechanisms (right and left ends figs. 6-5 and 6-6) for the pressure rolls to release the tension on the springs. Then



22.26

Figure 6-7.—Diagram for replacing feed ribbons on flatwork ironer.

tighten each nut as much as possible by hand. With an appropriate wrench, give the nuts for the No. 1 roll TWO COMPLETE TURNS, and the nuts of the No. 2 roll ONE COMPLETE TURN. Leave the nuts for the No. 3 roll FINGER TIGHT.

3. Turn the handwheel until the padded pressure rolls come into contact with the cylinder.

4. Turn on the steam and heat the cylinder and padded pressure rolls thoroughly.

5. Start the ironer and run it for 30 minutes or until the padding is packed snugly to the rolls.

6. If the rolls do not have enough pressure on them after the 30-minute run, turn the nuts clockwise 1/6 turn at a time until you get the desired pressure. Be sure to give the nuts at each end the SAME NUMBER OF TURNS. When pressure is satisfactory, tighten the locknuts over the adjusting nuts.

Some ship's laundries use asbestos padding and an asbestos-type material as a cover for repadding pressure rolls. It lasts much longer than the material listed above for repadding and re-covering.

HOW TO REPLACE FEED RIBBONS

The life of feed ribbons can be prolonged by cleaning them with a brush and cleaning fluid occasionally. Eventually, however, they must be replaced. The steps in the procedure are:

1. Wipe the excess grease and oil from the ends of the ribbon feed drive roll.
2. Remove the bib apron and the drag bar.
3. Cut the old ribbons and remove them.
4. Loosen the drive chain.
5. Remove the cotter pin and the pivot pin. Then swing the finger guard back over the first padded roll.
6. Remove the two dowel pins and the hexagonal head bolt which fasten the feed board brackets to the frame bracket and remove the feed board. See figure 6-7.
7. Place a small wood block (3" x 4") midway of the front tie rod to support the ribbon feed roll.
8. Remove the cotter pin from the lefthand ribbon feed drive roll bearing pivot pin; then remove the pivot pin, and the bearing from the roll shaft. You can then balance the roll on the wood block.

9. Place the feed board on top of the drive roll and balance it in this position.

10. Loop the feed ribbons over the drive roll and feed table.

11. Move the wood block to the left end, and then place the ribbons in the correct position.

12. Remove the wood block and replace the bearing on the left end of the roll shaft. Replace the pivot pin and the cotter pin.

13. Replace all parts and adjust ribbon tension and the drive chain.

WEEKLY AND SEMIANNUAL MAINTENANCE

WEEKLY

Once a week the engineering department should perform the following maintenance on the flatwork ironer:

1. Check the steam and drain connections and the steam traps.
2. Inspect the safety guard and interlock switch.
3. Check the oil lubrication fittings, and fill the oil and grease cups.
4. Tighten nuts and screws.
5. Check all moving parts.

SEMIANNUAL

Twice each year the engineering department should:

1. Remove gear guards, belt guards, and sprocket chain guards, and inspect gears, sprocket chains, and belts, and make necessary adjustments and repairs. Replacements should be made if necessary.
2. Adjust the tension of sprocket chains and V-belts.
3. Check trunnion and roller bearings and intermediate bearings.
4. Check for loose nuts and screws.
5. Clean all parts of machine.

TROUBLESHOOTING

If your flatwork ironer fails to turn out satisfactory work, use the guide below for troubleshooting:

TROUBLE	PROBABLE CAUSE(S)
1. Flatwork does not dry.	Work not properly extracted. Low steam pressure on ironer.
2. Flatwork becomes discolored after passing through ironer.	Work too damp. Check extraction time. Excessive amount of supplies. Washing supplies not rinsed from work. Improper cleaning and waxing of cylinder.
3. Flatwork curls up or rolls when fed into ironer.	Work too damp. Work oversoured. Ironer not waxed.
4. Flatwork wrinkled or rough.	Work allowed to air dry before ironing. (Cover damp work when not ironed immediately.) Careless feeding into ironer. Incorrect roll pressure.
5. Apron does not run true or "travels."	Unequal tension adjustment on both sides. Ironer not level.

CHAPTER 7

PRESSING AND FINISHING

New uniform items recently introduced into the Supply System are constructed of synthetics or blends consisting of cotton and synthetic fibers, including permanent press items. The new uniform items may be successfully finished by tumble drying if the procedures outlined in chapter 4 (Washing) and chapter 5 (Extracting and Drying) are adhered to. Cotton uniform coats, shirts, and trousers must be pressed before they are worn. Most ships' laundries have the presses and auxiliary equipment to accomplish this work, and any other small pressing jobs that inspection indicates may be required for items of synthetic fabric. Acceptability of the item of uniform that is finished in the tumbler-dryer will depend on the care taken during washing, extracting, and drying. An inspection system should be implemented to check the procedures, including quality of the finished product, to minimize additional finishing requirements and thereby reduce the need for press deck equipment. Drycleaning presses (discussed in chapter 9) can be utilized for additional finishing required for synthetic fabrics; this reduces the number and type of presses required. Do not press wool uniforms, permanent press, or synthetic garments on laundry presses (hot heads), as permanent damage to the fabric will result.

DESCRIPTION OF LAUNDRY PRESSES

A laundry press consists of a stationary padded buck fastened to a rigid metal frame. The head of the press is made of polished metal, and is lowered by a system operated by compressed air. Live steam is admitted to the head to heat it, and the condensed steam is carried away by a drain pipe. A steam trap prevents live steam from entering the drainage system. A table for holding a garment undergoing pressing is secured to the frame of the press beneath the buck.

The buck of a press is your work table. The size and shape of the buck may vary in accordance with the function for which it was designed. The buck is padded in a specific way for satisfactory pressing. This padding must be in good condition at all times, and must be changed when scorched, uneven, or worn. The amount and condition of padding affect head pressure, and you must readjust this pressure to get the amount required for good pressing.

The press shown in figure 7-1 is air operated. It is a utility press with a 51-inch head. Since the press is semiautomatic, it has no levers or pedals. The air buttons located on the front of the table are used for lowering, locking, and releasing the head. The two outside buttons lower and lock the head. Both hands must be used to press both buttons at the same time. The release buttons are the two inside buttons. The head can be released by depressing either the right or the left inside release button.

TYPES OF PRESSES

The types of presses usually installed in ships' laundries are as follows:

1. Tapered head—for general pressing of wearing apparel.
2. Rectangular head—for general pressing of wearing apparel and flatwork items.

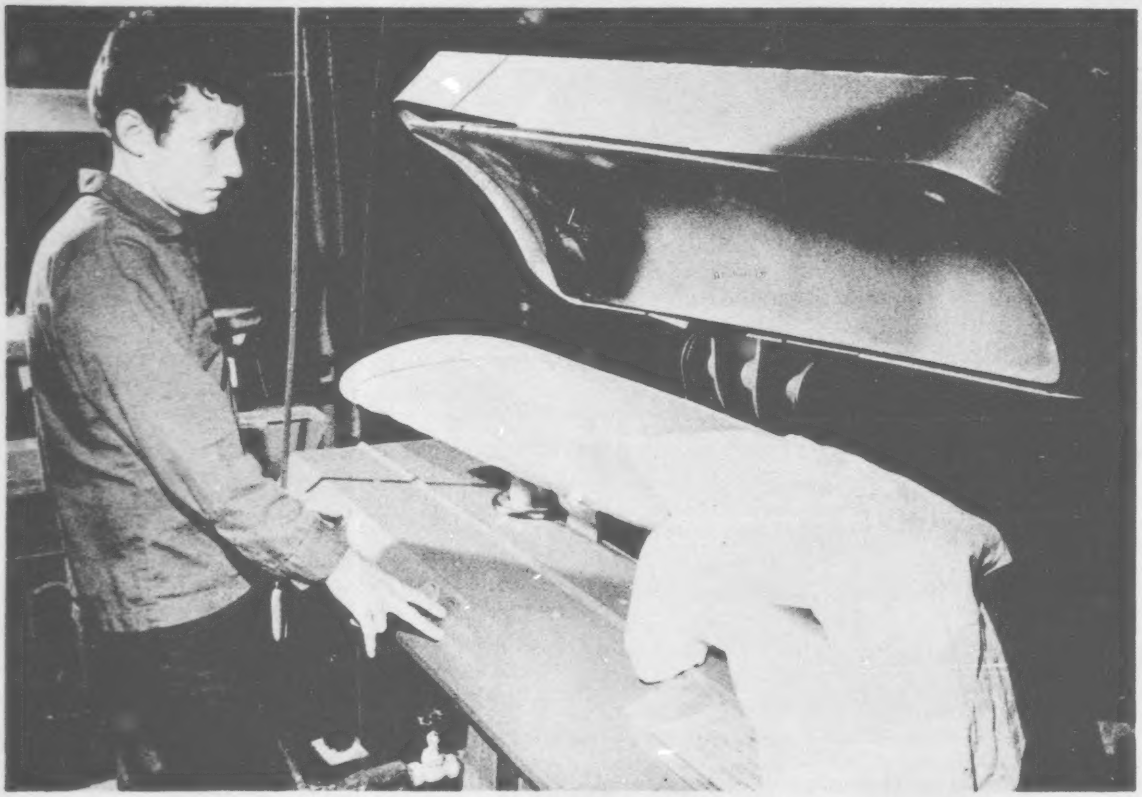


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Figure 7-1.—Air operated laundry press.

3. Triple head—for pressing shirt collars and cuffs simultaneously.
4. Puff iron—for removing wrinkles from shoulders of shirts and coats.
5. Cabinet double-single form—for pressing front, back, and yoke of a shirt in one operation.
6. Cabinet bag sleever.
7. Vertical pants press—for pressing trousers in one complete operation.

AUXILIARY PRESSING EQUIPMENT

Auxiliary equipment for pressing and finishing consists of hand irons, ironing boards, and spray guns attached to press units. A spray gun is essential for dampening garments which are too dry for good pressing. Cold water is used to dampen the garments. A small amount of water sprayed on the last part of a garment being pressed is necessary to compensate for the moisture lost while the other parts of the garment were pressed on the hot press. The use of a spray gun is also important when you are using a puff iron. After you apply the mist you can smooth out the wrinkles while the heat of the puff is drying the sleeves and/or shoulders.

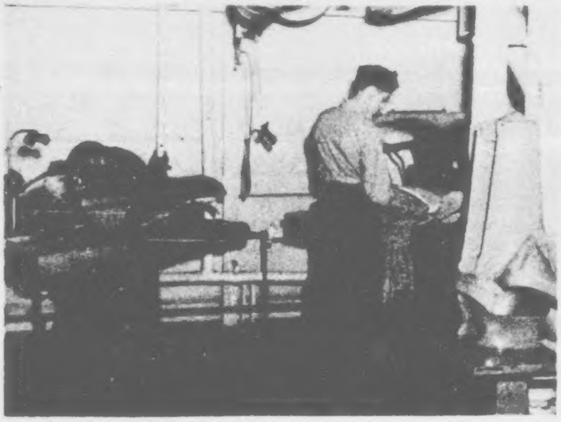
PRESS LAYOUTS

When two or more presses are placed together so that garments may be alternately pressed on each machine by one operator, the group of presses is called a unit. In large laundries separate units are used for shirts and for coats and pants. The placement of presses within a unit, or the placement of units in the laundry, is called the layout of the equipment. The layout of all laundry equipment in Navy ships is done by Naval Sea Systems Command, and changes should not be made without prior approval.

Illustration 7-2 shows a laundryman working on a shirt unit. He has a shirt on the left press, with the head down. Note that this is a special type press, with a special form for the collar.

On the right front, he has the sleeves of a shirt on a sleeve form. These metal forms are tapered to fit the sleeves. While these two shirts are being pressed, the laundryman is putting the collar and cuffs of a third shirt on a collar-and-cuff press in the rear of the unit. A spray gun is visible next to the back bulkhead. The presses in this unit are set up so one operator can handle them with the most efficiency.

Figure 7-2A illustrates another type of shirt pressing unit that is being installed on board Navy ships. This unit eliminates the need for the laundry press to press the body and bosom part of the shirt.



22.30

Figure 7-2.–Shirt unit layout.

Illustration 7-3 shows two laundrymen operating four presses in a parallel layout. Each laundryman is operating two presses. Note that two diagonally placed presses have the heads closed on shirts while the operators are putting shirts on the other two. With this system, they keep out of each other's way. The laundryman on the left is using a spray gun on a shirt back. These are utility presses.

In figure 7-4 you see presses of a different type in another unit. The small press in the rear is called a utility oval shaper, which is designed for topping of trousers, slacks, and small lays of wearing apparel. The two large presses are used for fronts and backs of coats and shirts, especially the backs.

Another type of press layout is shown in figure 7-5. This photograph was taken aboard a replenishment oiler (AOR). Several presses are visible, and on the left you will see a portion of a collar-and-cuff press and a shirt-folding table.

PANT-A-MATIC MODEL 800-850

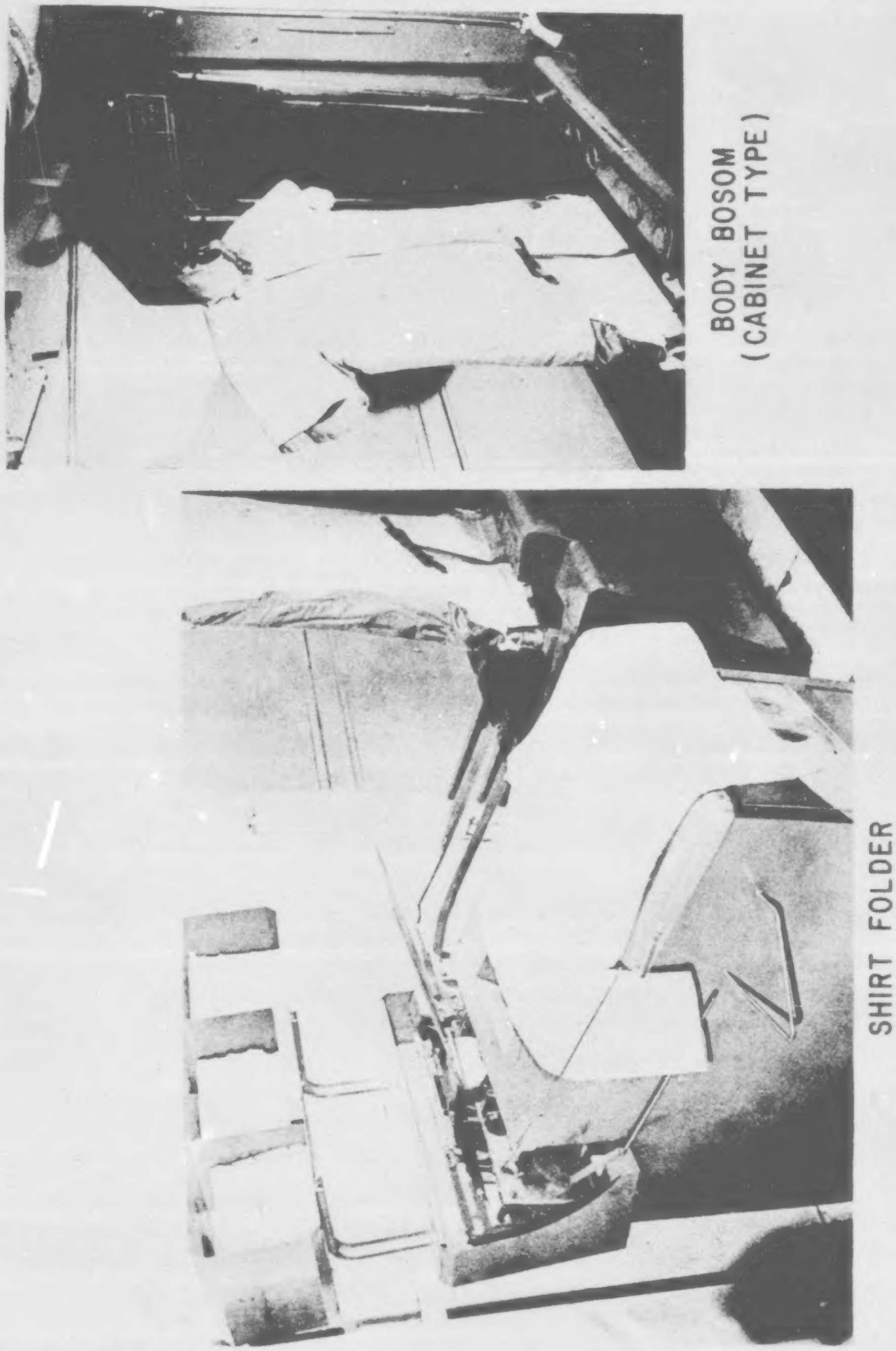
The automatic one-lay vertical pants press illustrated in figure 7-6 is being installed on board Navy ships for use in the ship's laundry and drycleaning plant.

The COLMAC Model 800 is designed to finish both cotton and polyester/cotton-blended pants. The pants can be either washed or drycleaned, damp or dry. The model 800 was primarily designed for washed pants with some moisture left in the fabric. The side chests are polished to give maximum finish to the starched cotton pants. The center buck is steam heated to facilitate drying of the legs of the pants.

The model 850 is different in that the center buck is designed to be hooked to a vacuum system much like a drycleaning utility press. The side chests are textured to prevent shining the material. The model 850 is to be used primarily with polyester/cotton-blended pants. The textured side chests help cut down the amount of "shine" on the darker fabrics.

Production

One operator and one pant-a-matic 800 can produce 60 pairs of cotton pants per hour, more



BODY BOSOM (CABINET TYPE)

SHIRT FOLDER

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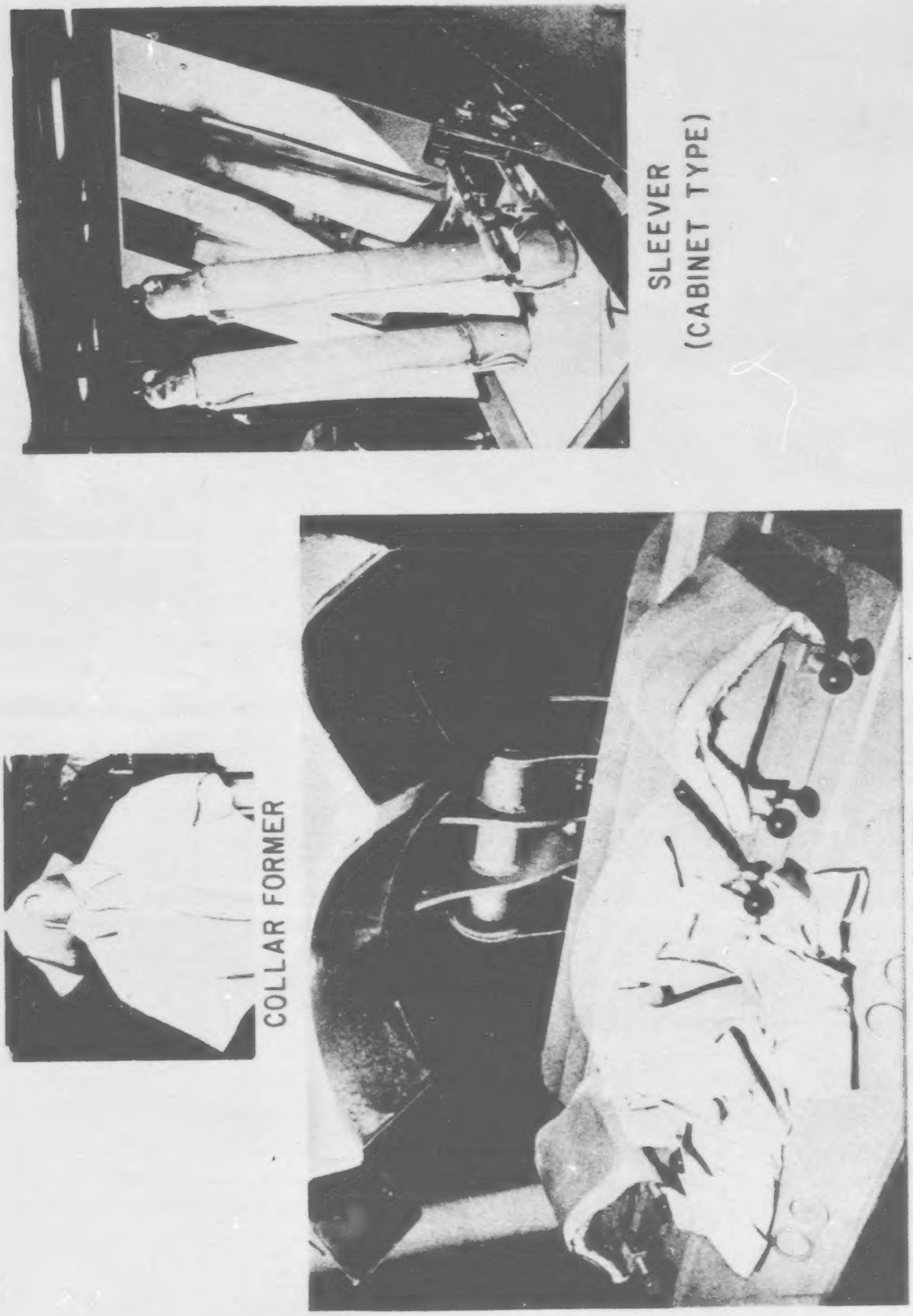
Figure 7-2A.—Another type of shirt-finishing unit.



SLEEVER (CABINET TYPE)

COLLAR FORMER

COLLAR AND CUFF

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Figure 7-2A.–Another type of shirt-finishing unit–Continued.

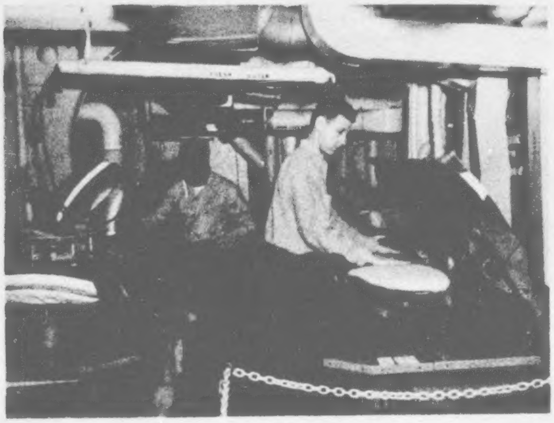

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Figure 7-3.—Press layout for two pressers.

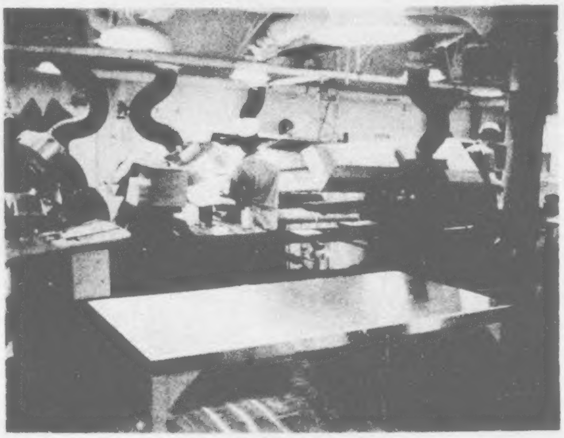

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Figure 7-5.—Layout of presses on a replenishment oiler.

if the pants are synthetic-blend or drycleaned. Refer to your manufacturer's manual for start-up and operation of the machine.

ROTOMATIC UNIT

A highly specialized group of presses for meeting large volume trouser pressing requirements with a minimum number of personnel is known as a rotomatic unit. This unit is composed of two circular units—one is made up of five legger-utility presses and the second is made up of 10 topper presses. The unit requires a manning of only two laundrymen; the personnel remain stationary and the presses rotate to them. A unit of this type is limited to use aboard aircraft carriers or possibly tenders.

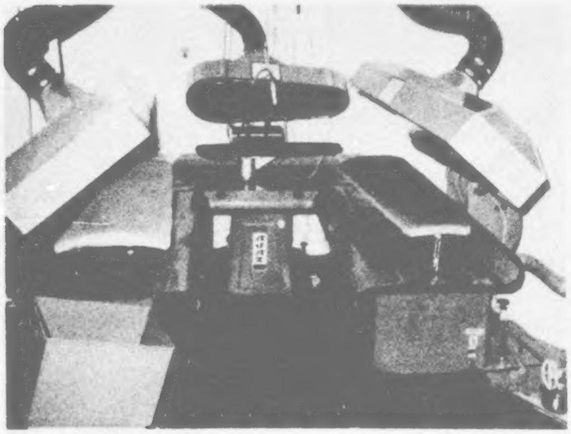

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Figure 7-4.—Press layout for one operator.

MAINTENANCE OF PRESSES

The laundry manager and operators should perform only minor maintenance on presses, but they should see that lubrication and repair records are maintained on each machine. You should study the manufacturer's instructions for each machine, and know how to oil them and make minor adjustments.

The steam pressure should be 100 pounds per square inch. Some of the presses have pressure gages. The air pressure on air-operated presses should be 75 to 95 pounds per square inch. In addition, engineering personnel should give the presses a hydrostatic test once per year. This test should be for 150 pounds per square inch for one minute.

SAFETY FEATURES

Be sure that safety devices on laundry presses are maintained in proper working condition at all times. The safety devices include gages, valves, and pushbuttons on air-operated presses. The arrangement of pushbuttons on air-operated presses is such that both hands must be used to close the press. Therefore, the hands of the operator can not be caught in the press. In no case should valves be bypassed or left permanently open; cable safety devices should also be inspected and kept in good order since cables that are either too slack or taut will prematurely stop the closing of the press.

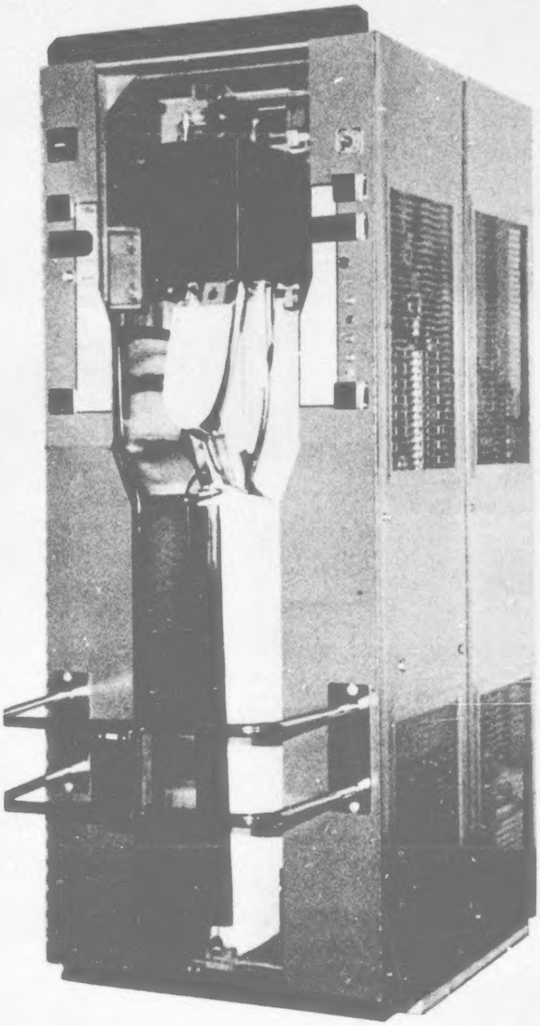

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Figure 7-6.—Automatic one-lay vertical pants press.

HOW TO PAD BUCKS

The padding on a buck should be uniformly thick. The padding should be free of low places or lumps. If this is not the case, the quality of pressing will be poor. When the padding becomes uneven, lumpy, scorched, or too thin (less than 3/4-inch thick), replace it. The procedure for doing this on different types and makes of presses varies slightly. Some presses are equipped with spring pads, others are not. The material listed below is required for padding bucks:

1. A metal spring pad, or steel wool pads.
2. Steel (to cover a spring pad).
3. Fine-mesh screen and a piece of double-faced flannel, or two pieces of double-faced flannel.
4. Covercloth, usually ready-made of nylon, dacron, or some other type of synthetic material. Asbestos is optional. Sometimes asbestos or covercloth is used between the flannel and steel wool pad.
5. Buck cover hooks or tension springs (generally), for holding the cover tight beneath the buck.

The procedure for padding the buck is simple. Unclamp or unhook the cover beneath the buck and remove all of the old padding. Then start with the metal spring pad, or steel wool pads, listed in number 1 above and follow with all the other items listed. Refer to figure 7-7 for a diagrammatic arrangement of the materials on the buck when metal spring pads are used.

The materials used over metal wool pads placed next to the buck vary slightly from those used on a metal spring pad. Metal wool pads of different thickness are used on presses which have spring pads on the bucks. When ordering metal wool pads, specify whether you want

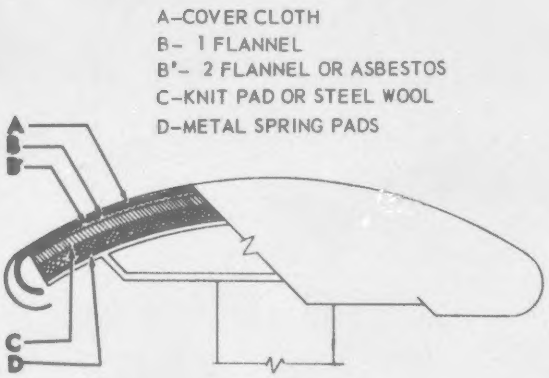

Figure 7-7.–Padding and metal spring pads on the buck.

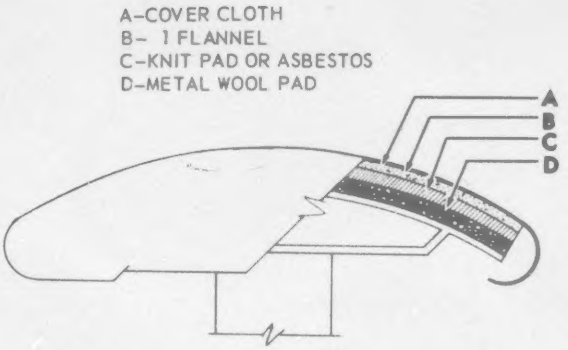

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Figure 7-8.–Padding and metal wool pads on the buck.

them for a press with spring pads. Check figure 7-8 for the procedure of padding bucks when metal spring pads are not used.

Synthetic covers last longer than cotton covers. The drawstring in the cover helps to hold the padding in place, but the tension springs on the clamps or hooks beneath the buck hold the padding firmly in place. They give an even pull all around the cover. Change covers when they become soiled or badly scorched.

When two layers of flannel are used in the padding, change one layer each week. Place the new layer on the bottom and the used layer on top. You can wash double-faced flannel and reuse it. If the flannel shrinks, use it on a smaller buck. If the flannel becomes hard, apply steam to the surface and work it with the hand until the flannel becomes pliable. Tumbling also makes the flannel pliable. If you use just one layer of flannel in the padding, change it every week, or at least every other week. Judge by the pressing workload.

Change the knitted padding when it becomes scorched or burned. No set time can be given for changing the knitted padding, but under normal operating conditions it should be changed about once a month. Steel wool padding lasts for one year under normal usage (40-60 hours per week).

Table 7-1 lists the guide-lines in proper padding and covering of laundry presses.

WEEKLY MAINTENANCE

The engineering department should perform the following weekly maintenance on laundry presses:

1. Check the lubrication fittings, and fill the oil cups to the proper level. Replace the lubrication fittings that have been broken or removed.

2. Check the operation of the head to find out if it returns smoothly to the fully upright position without shock when released. Adjust the counter-balance springs, shock absorber cylinder, and air vent as necessary.

3. Tighten any loose nuts and screws.

4. Inspect the steam and drain connections for tightness. Adjust any leaky valves.

5. Make certain that the steam traps are functioning properly, to ensure uniform heating of the head and buck without undue loss of steam.

6. Check the amount of pressure required on foot pedals of manually operated presses to lock the head in the pressing position. Excessive

Table 7-1.—Press Padding and Covering Standards

FLAT BED PRESSES—With Spring Padding (not including collar & cuff presses)

1. Metal Buck of Press—wipe clean each time metal pad is changed.
2. Plate of Coil Springs—make sure screen wire is in good condition each time metal pad is changed.
3. Metal Press Pad—when purchasing make sure to designate "for use over springs."

   METAL PAD REPLACEMENT SCHEDULE

   a. 36" to 54" long presses:
      (1) Large ships, 36 months.
      (2) Small ships, 48 months.
   b. Small or topper presses:
      (1) Large ships, 30 months.
      (2) Small ships, 36 months.
4. Treated Asbestos Boot (brown color)—replace only when it breaks up.
5. 50-oz. felted(punched) nylon pad—replace each time press cover is changed.
6. Nylon Press Cover (non-skid finish)—replace when it develops a hole in the top.

FLAT BED PRESSES—Without Spring Padding (not including collar & cuff presses)

1. Metal Buck of Press—wipe clean each time metal pad is changed.
2. Metal Press Pad—when purchasing make sure to designate "for use on bare buck."

   METAL PAD REPLACEMENT SCHEDULE

   a. 36" to 54" long presses:
      (1) Large ships, 36 months.
      (2) Small ships, 48 months.
   b. Small or topper presses:
      (1) Large ships, 30 months.
      (2) Small ships, 36 months.
3. Treated Asbestos Boot (brown color)—replace only when it breaks up.
4. 50-oz. felted (punched) nylon pad—replace each time the cover is changed.
5. Nylon Press Cover (non-skid finish)—replace when it develops a hole in the top.

COLLAR & CUFF PRESSES (if press has coil springs remove them, except if press is Ajax model MTH—on this one springs must be used on collar buck only.)

1. Metal Buck of Press—wipe clean each time metal pad is changed.
2. Metal Press Pad—when purchasing, make sure to designate "for use on bare buck."

Table 7-1.—Press Padding and Covering Standards (Continued)

COLLAR & CUFF PRESSES (continued)

METAL PAD REPLACEMENT SCHEDULE

- a. Large ships, 24 months.
- b. Small ships, 30 months.

3. 50-oz. felted (punched) nylon pad—replace after 40 hours actual press operation.
4. Nylon Press Cover (non-skid finish)—replace under any of following conditions:
   - a. Develops a hole,
   - b. Saturated with starch, or
   - c. Becomes stained or dirty so that shirts would be soiled.

AJAX MODEL CS SLEEVE PRESSES—Expander blade type.

Bucks of Press:

1. Metal Buck of Press—wipe clean each time covers are changed.
2. Metal Press Pads—when purchasing, buy in sets and designate "for use on bare buck."

METAL PAD REPLACEMENT SCHEDULE

- a. Large ships, 24 months.
- b. Small ships, 30 months.

3. Nylon Press Cover (slick finish) With 30-oz. Woven Nylon Flannel Sewn In—replace when cover develops a hole.

Expander Blades:

1. Metal Blade—wipe clean each time it is covered.
2. Combination Cover/Pad (one piece) with 21-oz. Woven Nylon Flannel Build Up—replace when it develops a hole. Designate if ring-and-bolt or hood fastener.

AJAX MODEL CBS SLEEVE PRESSES—Air Bag Type

1. Metal Buck of Press
2. Plate of Coil Springs—make sure the screen wire over springs is in good condition each time the metal pad is changed.
3. Special Metal Pad (brown cloth-covered)—when purchasing, designate "for use over springs."

METAL PAD REPLACEMENT SCHEDULE

- a. Large ships, 24 months.
- b. Small ships, 30 months.

4. Nylon Press Covers (slick finish) With Reinforced Air Bags—replace when covers or air bags develop a hole.

UNIPRESS MODEL MSA-A SLEEVE PRESSES

Bucks of Press:

1. Metal Buck of Press—wipe clean each time metal pad is changed.
2. Metal Press Pads—when purchasing, be sure to designate "for use on bare buck."

Table 7-1.–Press Padding and Covering Standards (Continued)

UNIPRESS MODEL MSA-A SLEEVE PRESSES (continued)

METAL PAD REPLACEMENT SCHEDULE

a. Large ships, 24 months.
b. Small ships, 30 months.

3. Nylon Press Covers (slick finish) with 21-oz. Woven Nylon Flannel Sewn In–change when the cover develops a hole.

Expander Blades:

1. Metal Blade–wipe clean each time it is covered.
2. Combination Cover/Pad (one piece)–replace when it develops a hole. When purchasing be sure to designate if blade has lock rod extension for short sleeves.

AJAX BOSOM/BODY PRESSES–On all purchases for these presses it is necessary to designate which style bucks are on press: 20"Std., 18"Std., Military 1, Military 2. Mere model number will NOT suffice.

1. Metal Buck of Press.
2. Plate of Coil Springs ON FRONT SIDE ONLY–make sure screen wire over springs is in good condition each time metal pad is changed.
3. Metal Press Pad–when purchasing, designate "for use over springs."

   METAL PAD REPLACEMENT SCHEDULE

   a. Single buck units, 36 months.
   b. Double buck units, 42 months.
4. 50-oz. Woven Nylon Flannel Pad–change each time the cover is changed.
5. Dacron Press Cover with Spring Supported Yoke Bag–change when the cover or air bags develop a hole.

UNIPRESS CABINET SHIRT UNITS–BOSOM/BODY

1. Metal Buck of Press.
2. Plate of Coil Springs–make sure the screen wire over springs is in good condition each time metal pad is changed.
3. Asbestos Screen Cloth (white)–replace each time the metal pad is changed.
4. Metal Press Pad–when purchasing, designate "for use over springs."

   METAL PAD REPLACEMENT SCHEDULE

   a. Single buck units, 36 months.
   b. Double buck units, 42 months.
5. 30-oz. Woven Nylon Flannel Pad–change each time cover is changed.
6. Nylon Press Cover (non-skid finish)–change when the cover develops a hole.

Expander Blades: Solid metal type.

1. Metal Blade–wipe clean each time it is covered.
2. Combination Cover/Pad (one piece)–change when it develops a hole.

Table 7-1.—Press Padding and Covering Standards (Continued)

UNIPRESS CABINET SHIRT UNITS–BOSOM/BODY (continued)

Expander Blades: Split-across-center type.

1. Metal Blade—wipe clean each time it is covered and padded.
2. 30-oz. Woven Nylon Flannel Pad—change each time the cover is changed.
3. Stretch Dacron Cover (MUST stretch lengthwise about 2")—change when the cover develops a hole.

padding on the buck may require extra pressure on the foot pedal to lock the head.

7. On air-operated presses, check the following:

a. Operation of the air control valves. All must function properly.

b. Cleanliness of the strainer in the air line.

c. Cleanliness of the mufflers.

d. Setting of the pressure and locking adjustments.

SEMIANNUAL MAINTENANCE

Twice per year the engineering department should perform the maintenance listed below on laundry presses.

1. Make all inspections, checks, and adjustments outlined in the maintenance section of the applicable manufacturer's instruction manual. Repairs should be made as necessary, and badly worn parts should be replaced.

2. On air-operated presses, the following additional work should be accomplished:

a. Remove and clean all air filters in a suitable solvent.

b. Examine the cups on closing and pressure cylinders. Replace the cups if badly worn.

TROUBLESHOOTING

A troubleshooting chart of the type shown in figure 7-9 should be posted in the laundry. It lists troubles you may have with presses, the probable cause(s), and the remedy.

HOW TO OPERATE A PRESS

Examine the cover and padding of a press before you heat it. Then check the head pressure by making several presses on it. If the padding is bad, do not use the press until it is repadded. If the cover is unsatisfactory, replace it with a new one.

Heat a laundry press gradually. Turn the steam valve partially open for 20 minutes and then open it completely. The press is then ready for use.

You have already learned that you lower the heads of air-operated presses with the finger pushbuttons on the table. Do NOT use the press unless both head lowering buttons are operating. Study the instruction manual to find out how to adjust head pressure, or have it adjusted.

The time required to press and dry a garment satisfactorily is dependent upon the following:

1. Type of material.

2. Moisture in the material.

3. Steam pressure (less than 100 psi will require longer time).

4. Effectiveness of the steam trap in carrying away the condensed steam, to allow unrestricted flow of live steam into the head chamber.

5. Head pressure.

An article with a rough, dry appearance, usually requires more than normal pressing time. Be certain, of course, that the article is damp enough when you start to press it. If the article

Trouble 12	Probable Cause(s)	Remedy
Rough dry	Scorched or compressed padding	Replace padding
	Improper pressure adjustment	Adjust for maximum pressure
Garments damp	Low steam pressure	Check supply pressure
	Steam trap inoperative	If cold to the touch, trap is not working properly
Press head does not close	Insufficient air pressure	Check pressure at compressor
	Leaky piston cup in operating cylinder	While operator is depressing pushbuttons, determine if air is blowing out around piston stem. If so, replace cup.
	Plugged strainer on air line leading to press	Clean strainer
	Defective Master Valve	Repair Master Valve
Press head does not open (Test with Timer and Hand Release Buttons)	Poorly lubricated operating cylinder	Lubricate cylinder
	Poorly lubricated bearings	Check all bearing points of lever system
	Defective Master Valve	Repair Timer
Press head opens slowly	Dry bearings in lever assembly	Lubricate bearings
Press head closes slowly	Insufficient lubrication in operating cylinder	Lubricate cylinder
	Insufficient air pressure	Check supply pressure
	Dry bearings in lever assembly	Lubricate bearings
	Leaky piston cup in operating cylinder	While operator is depressing pushbuttons, determine if air is blowing out around piston stem. If so, replace cup.
	Plugged strainer on air line leading to Press	Clean strainer
	Defective Master Valve	Repair Master Valve
Press head closes with a jar	Worn or broken linkage between Hydraulic Check and Press	Replace worn or broken linkage
	Hydraulic Check out of adjustment	Adjust Governor
Press head opens with a jar	Broken Hydraulic Check	If fault does not lie in adjustment, replace Hydraulic Check
	Improperly adjusted throttle valve on main air line	Check and adjust to reasonable speed
Press head does not lock	Clogged port hole in cylinder	Remove pipe plug and clean
	Improper pressure adjustment	Adjust pressure

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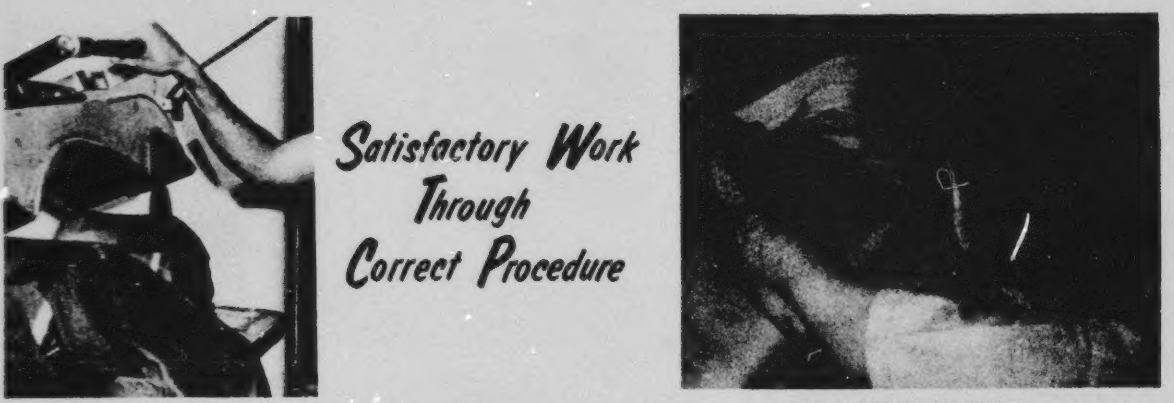
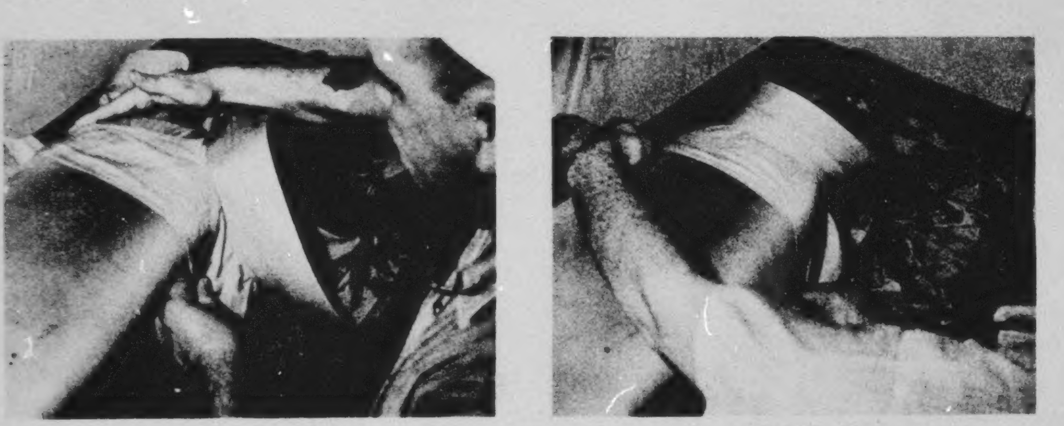
Figure 7-9.—Maintenance troubleshooting chart for presses.


Satisfactory Work
Through
Correct Procedure

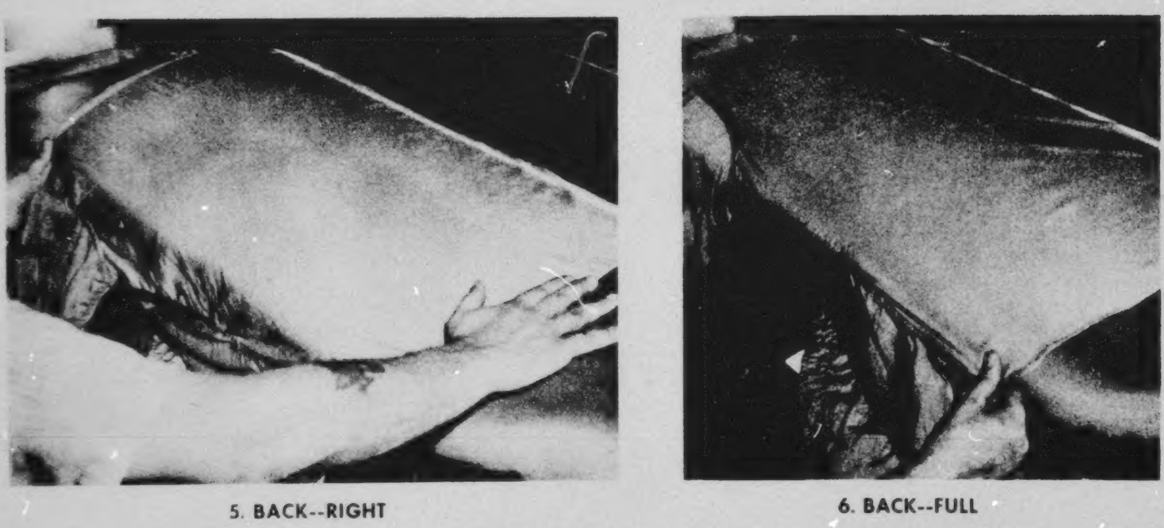
1. COLLAR AND CUFFS

2. RIGHT SHOULDER



3. LEFT SHOULDER

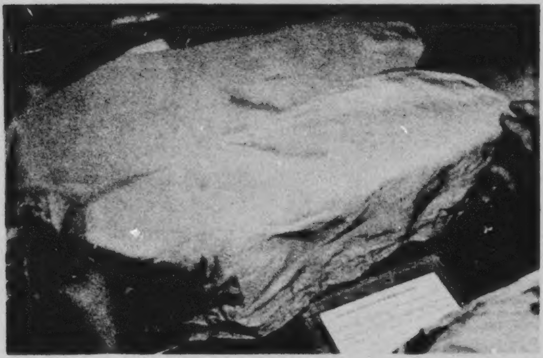
4. YOKE



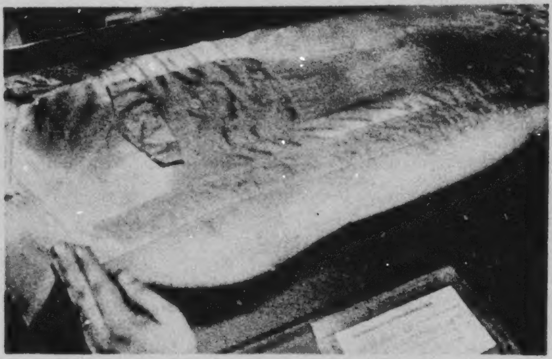
5. BACK--RIGHT

6. BACK--FULL

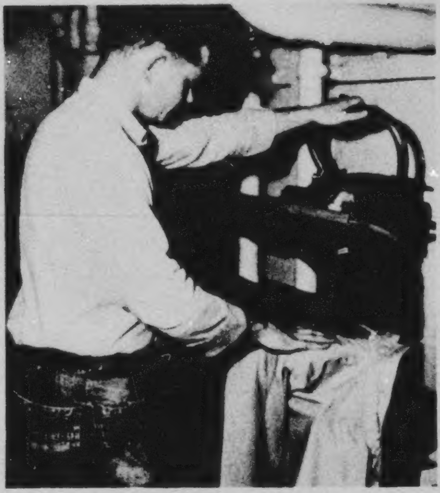
Figure 7-10.—Lays for pressing a shirt. 22.36



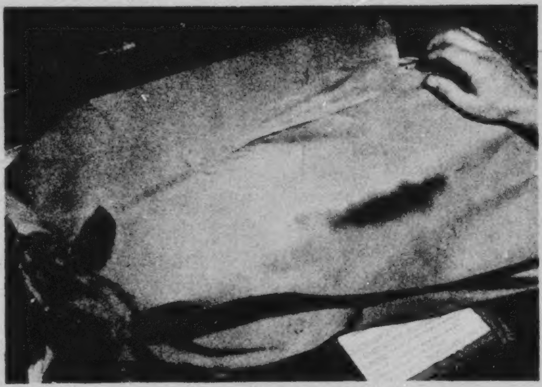
7. LEFT SIDE, AND BACK



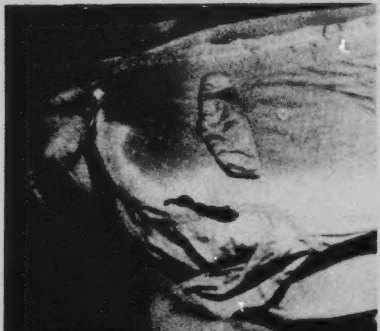
8. LEFT FRONT--FLAP UP



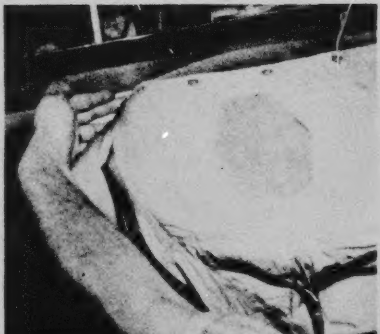
9. LEFT FRONT--FLAP DOWN.



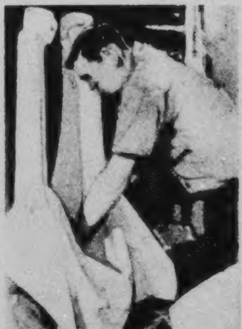
10. RIGHT SIDE, AND BACK



11. RIGHT FRONT--FLAP UP



12. RIGHT FRONT--FLAP DOWN



13. PRESSING SLEEVES ON SLEEVE FORMER.

Figure 7-10.—Lays for pressing a shirt—Continued. 22.37

lacks sufficient moisture for good pressing, add a fine spray to it with the spray gun. For normal pressing, keep the head down for about 15 seconds. Experience in pressing will enable you to tell when to add dampness to a garment before you press it, and how long it will take to press that particular type of material.

PRESS LAYS

In machine pressing, each garment is finished by a series of LAYS. Each lay is a position of the garment on the buck, and the series should cover the entire garment. Out of the way places which cannot be pressed with the machine should be smoothed out with a puff or hand iron.

Sequences of lays for shirts and trousers are described in the following pages. The ones given are considered the minimum for each article when good quality pressing is desired. The lays, however, are not standard with all pressers. For example, some laundrymen use two lays for pressing the front of shirts, one with the pocket flap up and the other with the flap down. Other pressers use one lay with the flap down, and get acceptable work.

When determining the proper sequence of lays for a garment, take into consideration the following:

1. The minimum number of lays required to do the work satisfactorily.

2. Logical sequence of lays, for easier and quick handling.

3. Part of the garment to be pressed last, to prevent damage to the finish of the most conspicuous parts of the garment.

The lays given for different articles below are now used in ships' laundries. The following lays for shirts and trousers do not include the use of a puff or hand iron for touch-up work on places difficult to reach with the press. When available, use these irons as necessary to get good quality work. A garment which is nearly finished should not be handled too much in doing touch-up work; that is, not to such an extent that you damage the finish.

PRESS LAYS FOR SHIRTS

Illustration 7-10 gives the sequence of lays for pressing a shirt on presses generally available in ships' laundries. The first lay shows the collar and cuffs properly placed on the press. (NOTE: If this first step is improperly done, the result will be broken buttons and wrinkled material. Your supply officer and the laundry crew receive criticism when this happens.) Some laundrymen press the yoke first on this press and then the collar and cuffs. The second lay is for the right shoulder. Note how the presser holds the shirt with both hands in order to make the desired lay. Then comes the left shoulder, followed by the lay for the yoke.

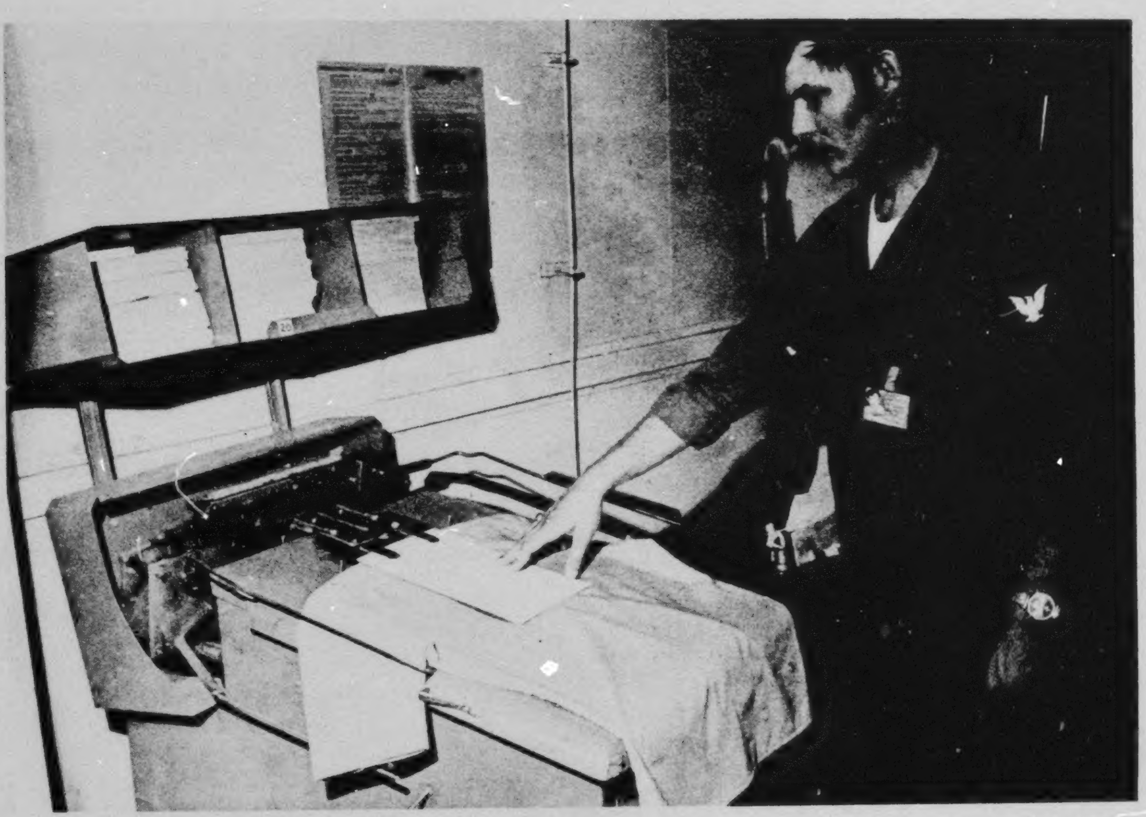
All other lays for pressing a shirt follow in sequential order, as listed. Note the pull the laundryman is exerting on the shirt sleeves on the sleeve form. After he has removed all wrinkles from the sleeves, he can press the shoulders on the puff iron. He needs the spray gun to get the correct dampness when using the sleeve form and puff iron.

Folding Shirts

Two different types of shirt-folding tables are used in ships' laundries.

One shirt-folding unit is automatic and it is pneumatically controlled. The automatic shirt-folding table, illustrated in figure 7-11, folds the shirts with minimum assistance from the operator. After the shirt is folded, the operator places a paper band around the body of the shirt.

Another type of shirt-folding table has a collar former and a metal plate over which the front parts of the shirt can be folded to get the correct form. The metal plate is hinged and can be raised and lowered as desired. Folding with this equipment is manual; the laundryman does



22.92

Figure 7-11.–Shirt folding machine.

everything. The procedure for doing the work is illustrated in figure 8-2. It was put in the discussion of assembly of material in chapter 8 because it emphasizes the importance of careful handling of finished laundry.

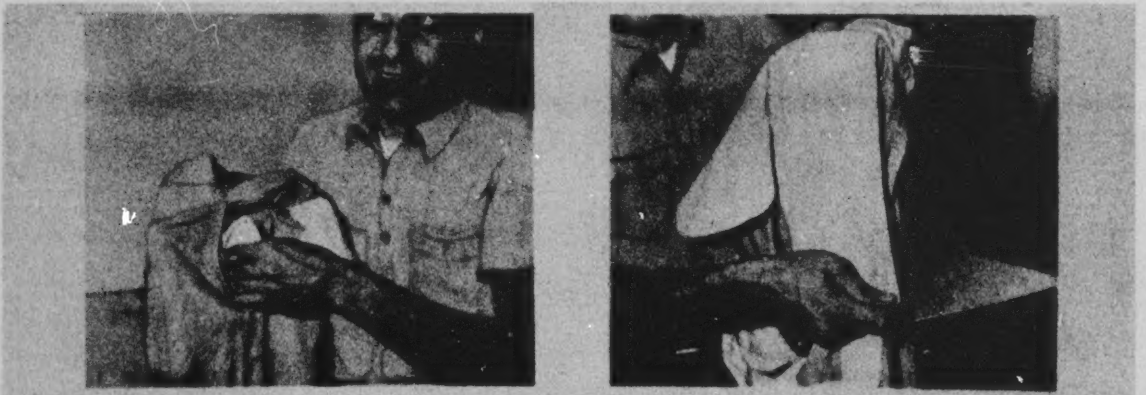
PRESS LAYS FOR TROUSERS

Check figure 7-12 for the lays that are used to press a pair of trousers.

Remove the trousers from the damp box. (Keep a wet net over the damp box at all times.) Straighten out the trouser pockets as illustrated in the first two lays of figure 7-12. Shape the trousers with your hand and dampen, if necessary. Then, make a left front and a right front lay and dry, as shown in lays 3 and 4. Again shape the trousers with your hand and dampen, if necessary. Next make lay Nos. 5 and 6, the right rear and the left rear pocket lays.

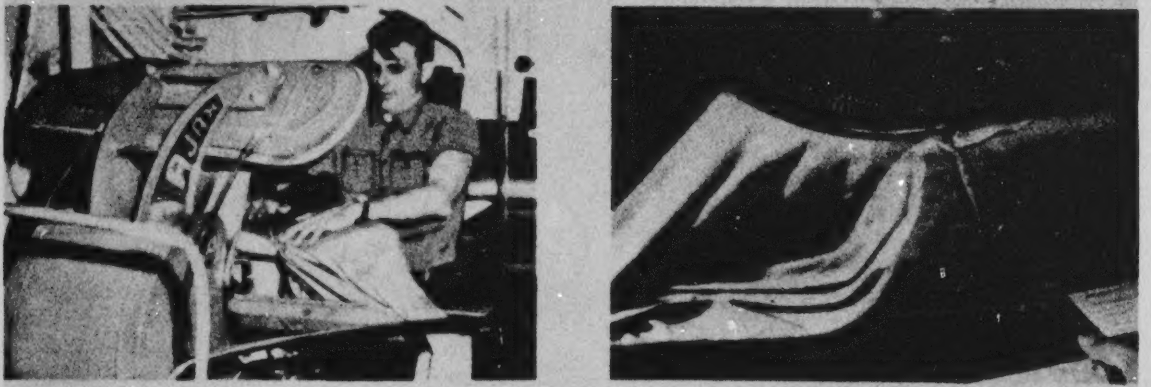
Remove the trousers from the press and match up the leg seams as shown in lay Nos. 7 and 8. Place the trousers (left leg inseam) on the large end of the buck. Shape the trousers with your hand and dampen, if necessary, making lay No. 9. Lower the press head. Raise the head when the trousers are dry. Repeat the above procedure for lay No. 10, left leg, outseam.

Remove the trousers from the press. Then, replace the trousers (right leg inseam) on the buck of the press. Shape the trousers with your hand and dampen, if necessary. Make lay Nos. 11



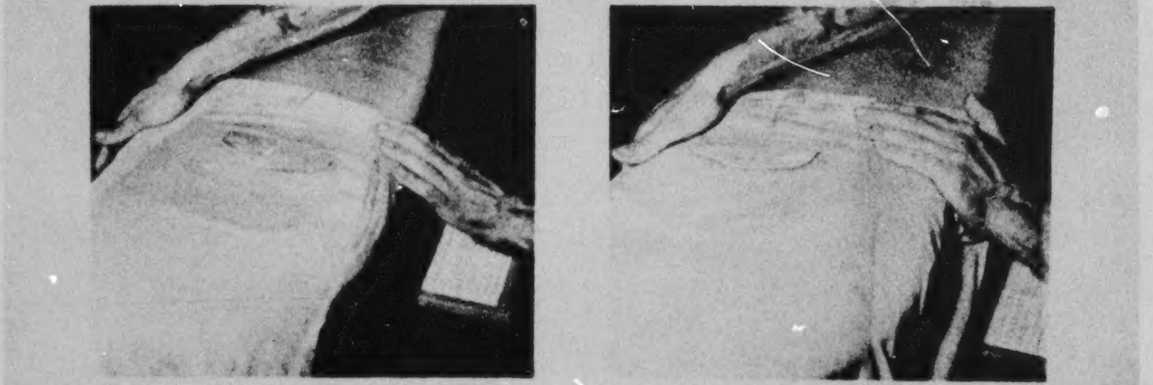
1. PUTTING POCKETS INSIDE

2. REMOVING WRINKLES FROM POCKETS



3. LEFT FRONT

4. RIGHT FRONT

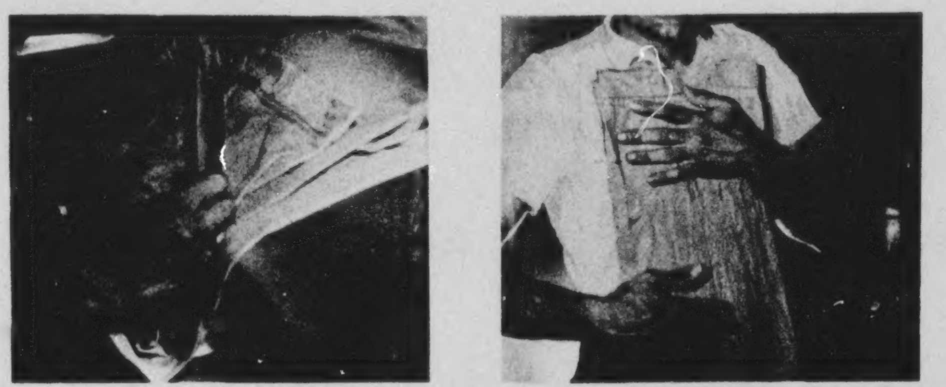


5. BACK POCKET, RIGHT

6. BACK POCKET, LEFT

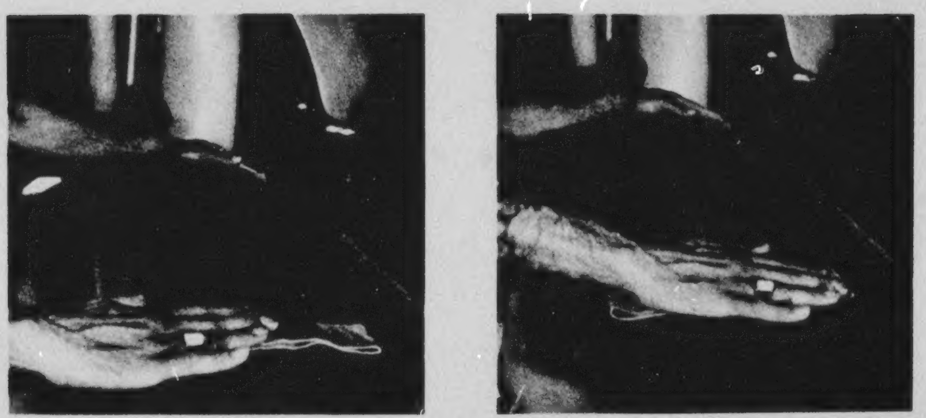
22.39.1

Figure 7-12.—Lays for pressing trousers.



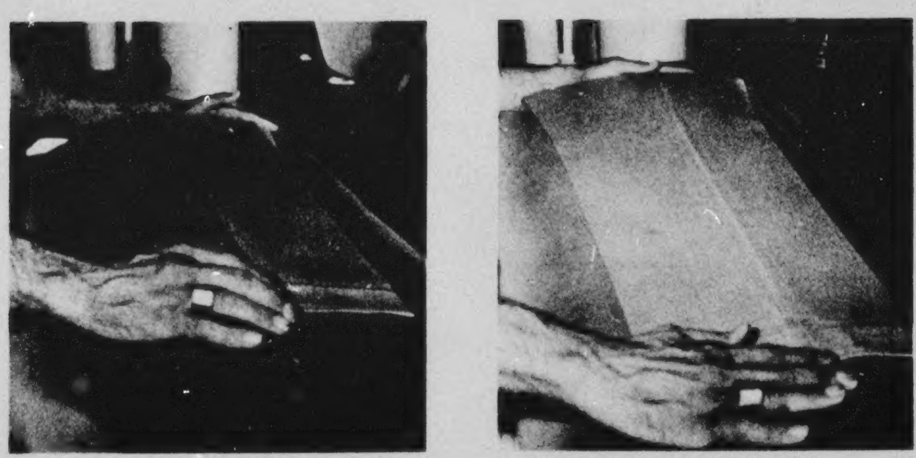
7. MATCHING INSEAMS

8. INSEAMS MATCHED



9. LEFT LEG, INSEAM

10. LEFT LEG, OUTSEAM



11. RIGHT LEG, INSEAM

12. RIGHT LEG, OUTSEAM

22.39.2

Figure 7-12.—Lays for pressing trousers—Continued.

and 12. These lays are the same as lay Nos. 9 and 10 above.

When the pressing procedure has been completed, make three folds in the trousers and stack them.

FINISHING CAP COVERS, GARRISON CAPS, AND TIES

Finish cap covers on a puff iron, if available, You can also press them with a hand iron, and press the band on the small end of a press.

You can press garrison caps in two lays on any type of press. Use one lay for each side. Do NOT press caps with leather bands on a laundry press. The leather will not withstand the temperature of the hot head.

When pressing ties, cut a cardboard form that will fit inside to hold them straight. Then press with two lays, one for each side. Do not press wool worsted ties on a laundry press. Use a press in the drycleaning plant, with a covered head.

CHAPTER 8

ASSEMBLY AND ISSUE

In this chapter we are concerned with assembly and handling of articles both in individual bundles and in bulk lots. Bulk lots which are tumbled can be loaded directly into the laundry bags in which they were brought to the laundry. Such is not the case, however, with items in an individual's bundle. This is a matter of (1) careful handling, (2) thorough inspections, and (3) accurate counting. Each of these is discussed briefly. To avoid mixups of articles, process one lot at a time.

CAREFUL HANDLING

Handle finished laundry with care. Collect it promptly and place it in the proper bin. Do not permit folded shirts, for example, to pile up on work tables or on shelves over the tables. Check figure 8-1. The shirts on this table have accumulated to such an extent that they may slide off to the deck and become soiled or wrinkled. When finished work is soiled or wrinkled by rough or careless handling, reworking is the usual result.

Some ships' laundries have shirt folding equipment on tables in the assembly room. Figure 8-2 shows a laundryman using one of them. The procedure for folding a shirt illustrates the importance of careful handling because each step must be made in order and in a careful manner. The sleeves, for example, must be folded in a specific way. Study each step in the illustration.

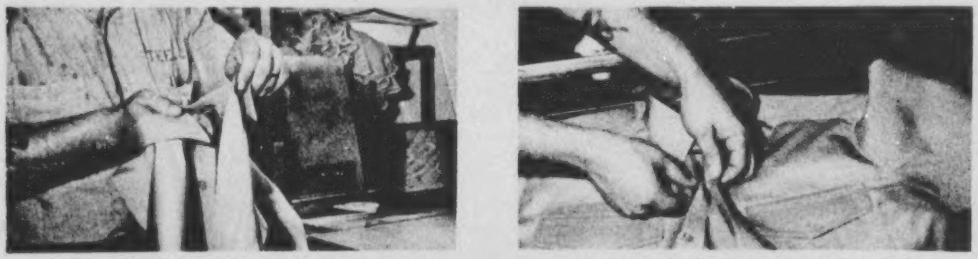
All finished laundry should be handled with care. Shirts are merely used as an example. No shirt, or any other article, should be returned to its owner unless it represents the best quality of work and care your laundry can give it. Streaks, stains, broken buttons, or any blemishes on finished work are usually inexcusable and should be corrected before returning the article to its owner.

22.42

Figure 8-1.—Folded shirts on shelf in ship's laundry.

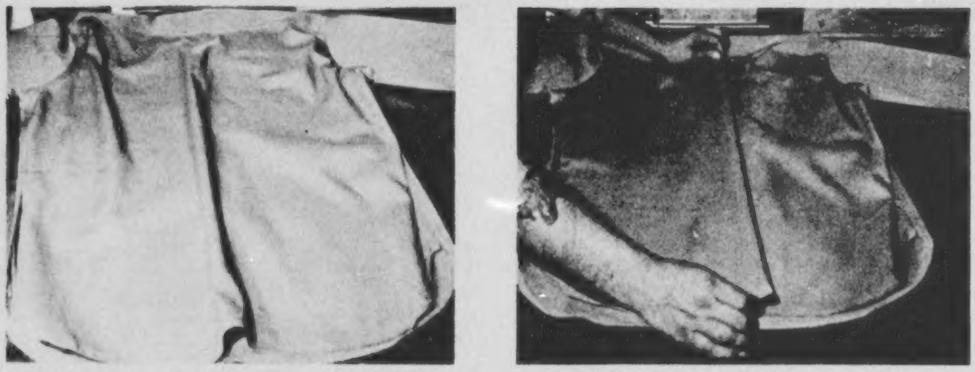
THOROUGH INSPECTIONS

When you receive finished work in the assembly room, check each piece for cleanliness, stains, scratches, marks, or any type of blemish. Chapter 7, Pressing and Finishing, gives the standards of quality for finished work. These are the things you must look for when inspecting laundry. A shirt, for example, should have a QUALITY LOOK; that is, it should be thoroughly clean, free of blemishes, smoothly ironed, and have the proper creases. What



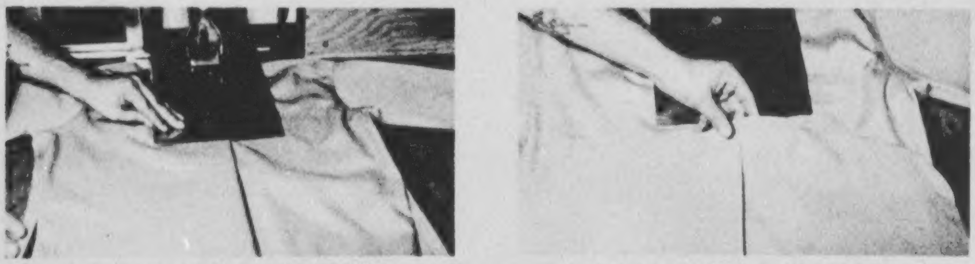
1. PICK UP SHIRT BY COLLAR

2. PLACE SHIRT ON FOLDING TABLE, BACK DOWN, BUTTON FRONT



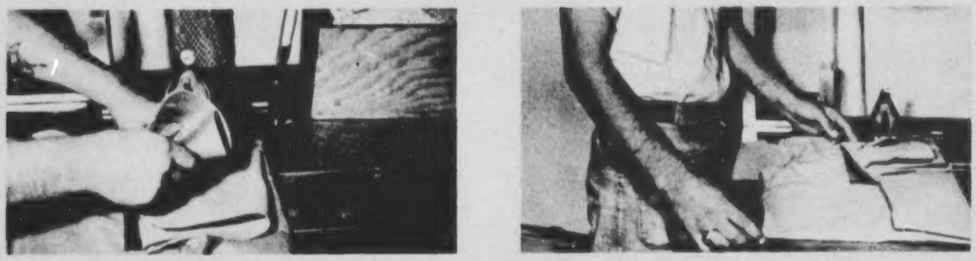
3. PLACE SHIRT FACE DOWN ON COLLAR HOLDER

4. FORM CREASE CAREFULLY IN BACK



5. BRING FOLDING FORM DOWN OVER TOP OF BACK

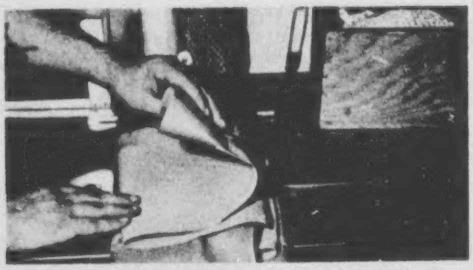
6. FOLD TAIL UP TO BOTTOM OF FORM



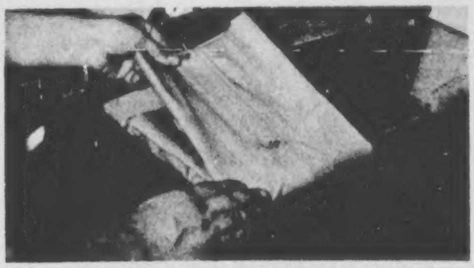
7. FOLD RIGHT SLEEVE OVER FORM

8. FINISH RIGHT SLEEVE FOLD

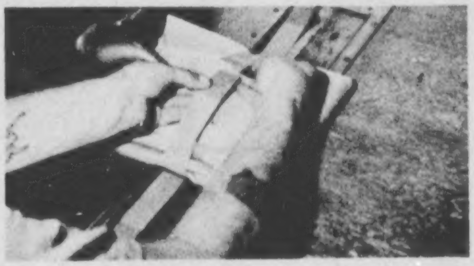
Figure 8-2.—Procedure for folding a shirt. 22.43



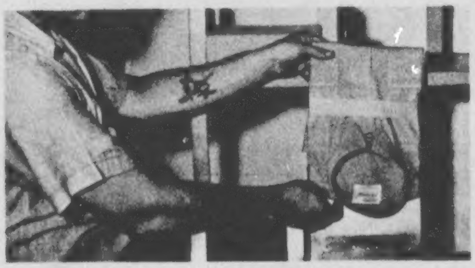
9. FOLD LEFT SLEEVE--SAME AS RIGHT



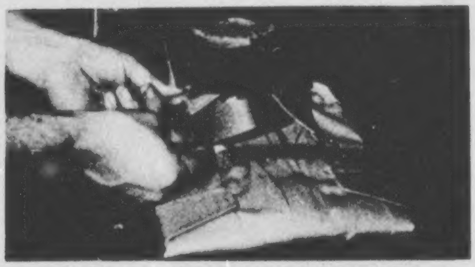
10. FOLD LOWER HALF OF SHIRT UP OVER FORM



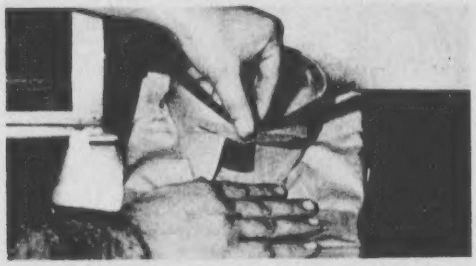
11. PLACE PAPER BAND AROUND SHIRT



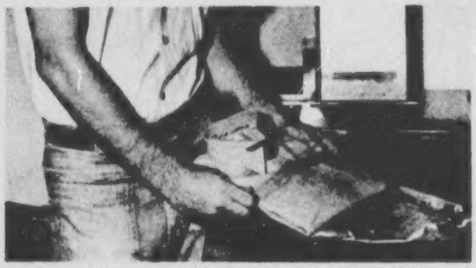
12. REMOVE SHIRT FROM FORM



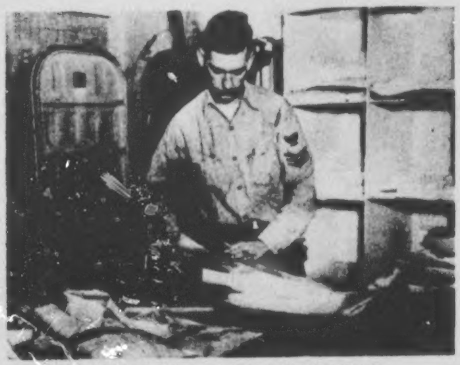
13. INSERT CARDBOARD AROUND COLLAR



14. FOLD CARDBOARD INSIDE COLLAR



15. DRAW CELLOPHANE BAG OVER SHIRT



16. FOLD AND CLOSE END OF BAG

Figure 8-2.—Procedure for folding a shirt—Continued. 22.44

applies to the inspection of shirts, of course, applies to every article. Remember that you have the ultimate responsibility of approving laundry before it is returned to its owner.

If you come across finished articles that do not pass inspection, set them aside for reprocessing. The procedure for handling SENDBACKS is explained later in the chapter.

ACCURATE COUNTING

As you know, every individual expects the return of all articles he presented to the laundry for laundering. The way to ensure getting all the articles in an individual's bundle back to him is to assign a separate bin and match the identification mark on finished articles with the ticket as you bin them. Attach officers' laundry lists to the bins in alphabetical order for easy processing. Use numerals when initials are duplicated.

ASSEMBLING INDIVIDUAL BUNDLES

When you receive items from a lot of laundry in process, prior to assembly of articles, place the individual's ticket on the front of each bin and then proceed to put the finished articles as marked in the proper bin. Check figure 8-3. After all the articles in an individual bundle have been binned, it is best to wrap and tie the bundle immediately. Attach the laundry list firmly to the bundle, under the string, or fastened to the wrapping with glue or tape. Should you be unable to wrap a bundle immediately, fold the laundry list and place it between the first two articles in the bundle, with the folded edge out. A glance at this bin later will inform you that the laundry is satisfactory and all accounted for and is ready to be wrapped.

The procedure for assembling individual bundles follows:

1. When items in the bin correspond to the items listed on the individual ticket, remove the items from the bin with the ticket and check them against the laundry list again. This is a double check to make certain that no article has disappeared from the bin.

22.45

Figure 8-3.—Laundry in bins in assembly room.

2. Place the heaviest articles in a laundry bundle on the bottom. Save the shirts for the top. Pair them, with the collar of one shirt next to the bosom of another. An odd shirt should be placed face down on the bottom of the shirt stack. The weight on pressed and folded shirts should be light.

3. Wrap the bundle and fasten it securely, but NOT tight. If a string is used instead of wrapping tape, do not tie it so tight that the laundry will be crushed.

4. Put the laundry list under the wrapping string, on the end where it will be visible when the bundle is placed among other bundles. If wrapping tape is used, tape or paste the laundry list on the end of the bundle.

ASSEMBLY OF BULK WORK

Since bulk lots include both tumbled and pressed work, the lots should be delivered to the laundry in separate division bags, each bag to be marked "pressing" or "tumbling." Divisional dungarees to be pressed should be turned inside out; this would be helpful for the press operator, since trousers are pressed on the reverse side.

Those items that have been pressed should be bundled in lots of 10 shirts or 10 trousers for easier checking against the items listed on the receiving log.

Flatwork lots include bath towels which are tumbled or ironed and folded, and flatwork which is ironed (sheets, etc.) and folded.

Stack similar items in the same stack, so that they can be tied with a heavy string and be easily carried. Mattress covers, for example, should be put into one stack and towels in another.

Tie the stacks and put them into the same laundry bags in which they were presented to the laundry. Then put the bags in the issue room for pickup as scheduled.

SYSTEM FOR HANDLING BULK LOTS

The following system is recommended when bulk lots are checked into the laundry.

1. The division petty officer delivers bulk laundry to the laundry receiving room.

2. The laundry bag is weighed and the weight is noted in the Bulk Lot Laundry Log. The "received by" and "delivered by" columns of the log are signed by the laundry petty officer and the division petty officer to acknowledge the delivery weight.

3. Upon completion of the work and when the laundry is picked up, the bag is again weighed with the post-processing weight noted in the log. Both petty officers sign the log upon issue of the finished work.

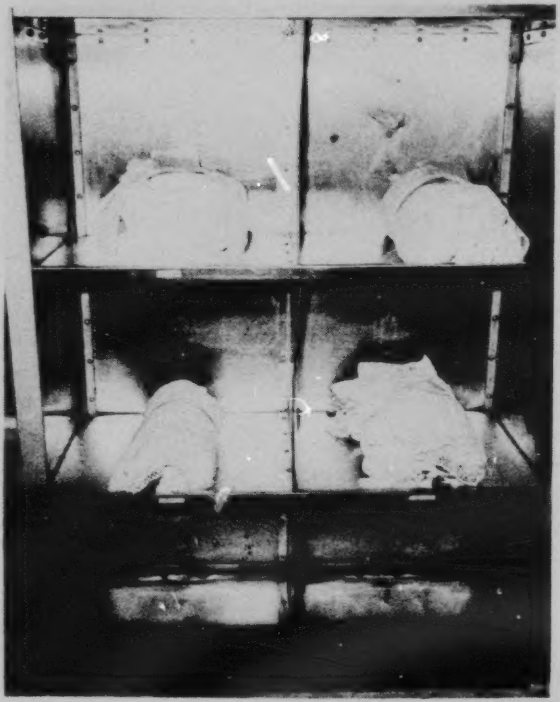
In a 50-pound bag of laundry it has been found that a four pound drop in weight is acceptable in ensuring that no articles have been lost. Very soiled clothing may even lose more weight.

The log can be referred to when a division does bring its laundry back to the laundry issue room claiming unacceptable losses of clothing. Receipt and issue of bulk laundry can be compared. A one pound loss in weight for instance on a 50-pound bag of laundry would indicate that the loss problem may be occuring in the living compartment rather than the laundry.

The above method for checking in and issuing finished bulk laundry is particularly useful to large ships where the counting of lots is impractical. The Bulk Lot Laundry Log is illustrated in chapter 2, figure 2-3.

HOW TO HANDLE SENDBACKS

Sendbacks are articles in individual bundles and bulk lots which must be sent back for reprocessing. Place an article sent back for reprocessing in a net so that it can be reworked immediately. Because sendbacks hold up delivery of laundry, they should receive special attention, so that you can make delivery on schedule. Recheck on them occasionally to



22.93

Figure 8-4.—Bundled laundry ready for delivery.

make certain the desired work is being accomplished. If laundry is torn or is damaged in any other way, if the work desired cannot be accomplished, or the finished work cannot be delivered on schedule, make appropriate notes and inform the laundry officer immediately.

ISSUING LAUNDRY

Issue finished laundry in accordance with the schedule. Provide space for laundry that is ready for issue. You need shelves or tables for wrapped bundles and space for laundry bags. In case you have a special room for receiving and issuing, put finished bundles neatly on shelves in alphabetical order. Hang trousers and coats on hangers.

Issue laundry to authorized persons only, those designated on the schedule, or to individual owners. Ensure that proper signatures are obtained and that the count reflected is accurate. This is necessary to establish validity in laundry claims. Figure 8-4 illustrates bundled laundry ready for issue to its owner. Any problems encountered in issuing laundry to officers, chiefs, mess management specialists, or other personnel should be reported to your immediate supervisor.

CHAPTER 9

DRYCLEANING AND FINISHING

Because some fabrics are damaged by washing in water, it is best to dryclean them—that is, wash them in some other substance that will cleanse them without damage. Only synthetic, perchlorethylene/tetrachloroethylene, or fluoro-carbon solvents are authorized for use on board Navy ships to dryclean fabrics.

Carriers, tenders, repair ships, and some other Navy ships have drycleaning plants. Tenders and repair ships usually provide drycleaning service for the ships to which they render other service.

ORGANIZATION AND MANAGEMENT

The ship's drycleaning plant, like the laundry, is a service in the supply department under the supervision of the ship's store officer. The number of Ship's Servicemen and strikers assigned depends upon the workload and the equipment. On carriers and tenders where the plant is much larger than on other ships, there may be a supervisor, an assistant supervisor, and six to ten additional men.

The petty officer assigned as supervisor is responsible for preparation of the drycleaning schedule, procurement of supplies, training of personnel, and the entire operation of the plant, as well as for cooperation with engineering personnel in maintenance of the equipment. The supervisor assigns the other personnel so as to accomplish the work as efficiently as possible, and rotates them as feasible to give them experience in all tasks the plant performs.

DRYCLEANING SCHEDULE

As in the laundry, a schedule is necessary for controlling the delivery, processing, and issue of drycleaning. To prepare such a schedule, start with a flow chart of all operations through which articles to be drycleaned must pass from the time they are received until they are ready for issue. (See fig. 9-1.) Then review each stage to determine time, space, equipment, and operating personnel required, and any other factors that will affect your schedule. Important points to consider are:

SPACE.—Limitation of space requires rigid control of the schedule from the standpoint of receipt and issue, so that the section can handle the maximum amount of work in the space available. Do not receive more dry weight than can be processed in one normal working day, except under very unusual conditions.

DELIVERY AND PICKUP.—It is necessary to define clearly the responsibility for both delivery and pickup.

TYPES OF SERVICES.—If services include cleaning of items other than regular uniform clothing, those items should be clearly defined, and the days when such services are available should be listed. This phase of the schedule may have to be flexible, especially for the tender-type ship—which will be offering services to ships alongside when in port, but only to her own ship's company when underway. Never schedule services for large lots of such items as flags or foul weather jackets at a time just preceding a personnel inspection. Plan to receive

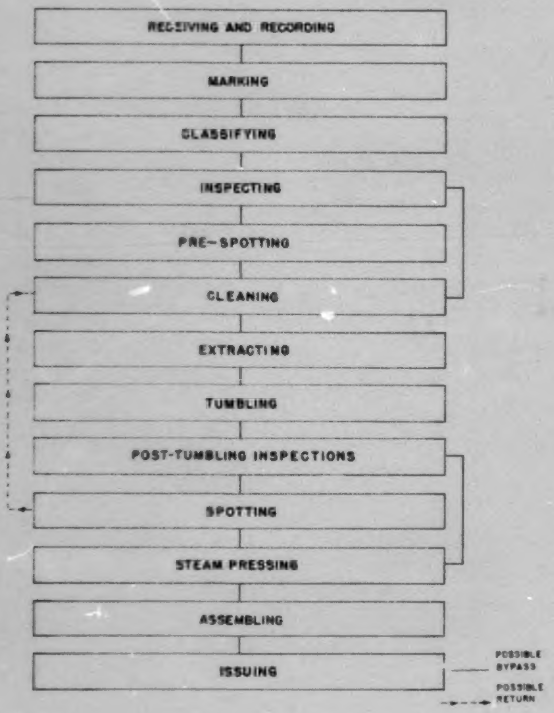


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Figure 9-1.—Drycleaning flow chart.

and service some articles of uniform clothing in each day's schedule.

With the new Navy enlisted uniform there may be a larger demand for drycleaning service. Consideration should be given to handling the uniform drycleaning requirement as a bulk (division/group) load. By having each article permanently marked for identification by individual personnel, much assembly and issue labor and time will be eliminated and the service improved. Officers' and chief petty officers' clothing can be processed on an individual identification basis as noted later in this chapter. Clothing should be permanently marked in accordance with the U.S. Navy Uniform Regulations to establish ownership.

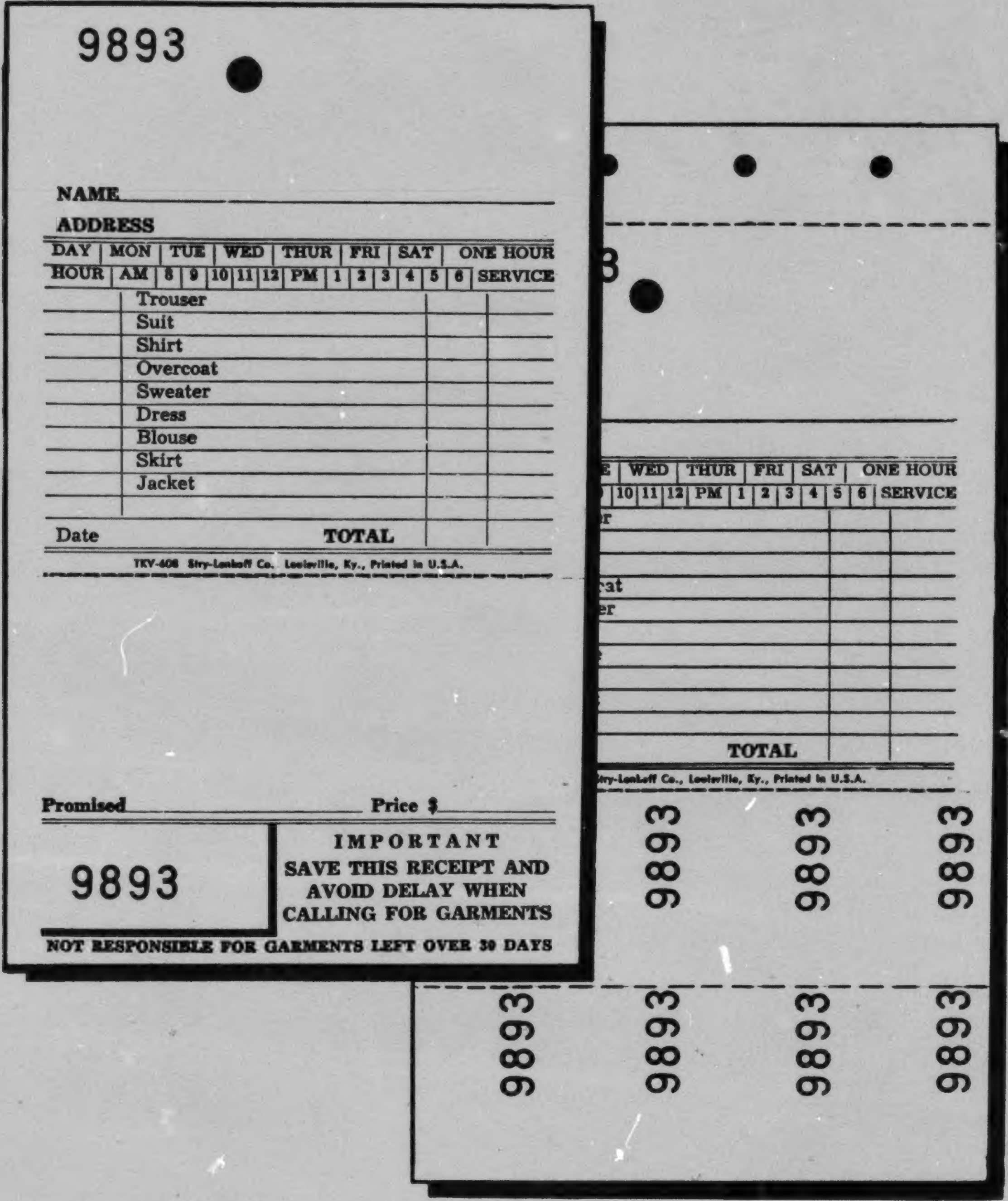
DEADLINE FOR RECEIPT.—It is advisable to set a deadline for receipt of articles at not later than 0900 daily. This is very important. Most Navy drycleaning units have a washer with two compartments, and these compartments must be loaded with equal dry weight loads of garments of the same type material. Equal loading of the two compartments is critical, since even one-fourth pound variation may cause vibration. By requiring delivery prior to 0900, the sorters can easily sort the articles into proper loaders and keep the washer operating to capacity without having to wait for sufficient articles of one type to make a load.

GROUP OR CLASS SCHEDULING.—The type of drycleaning performed aboard ship lends itself easily to group or class scheduling. Because of the uniformity of articles received, and since each washer load must be of a similar material, it is quite logical to schedule enlisted blues one day, foul weather jackets, flags, and officer and CPO blues another day. This plan, or a similar one, will bring in articles that can be divided into not more than two or three material groups for each day of work.

READJUSTMENT OF SCHEDULE.—With experience, you will be able to set up and adjust the schedule to meet specific conditions. For planning purposes, with a synthetic drycleaning unit, one load per hour can be produced. By computing the average weight of each article and the number of such articles per man which will likely be received for dry cleaning, you can determine the number of persons who can be served in one day's schedule.

DRYCLEANING LIST AND TAGS

A drycleaning list is a record of drycleaning processed for an individual. A sample drycleaning list is shown in figure 9-2. Such a list saves time and work in receiving and issuing, and also reduces the probability of misplacing articles. You can use it to check off finished work returned to the assembly room. The list provides for plant control, customer receipt, financial control, and furnishes eight tags for identifying the items that are going to be drycleaned. The procedure for using the marking



9893

NAME

ADDRESS

DAY	MON	TUE	WED	THUR	FRI	SAT	ONE HOUR							
HOUR	AM	8	9	10	11	12	PM	1	2	3	4	5	6	SERVICE

Trouser
Suit
Shirt
Overcoat
Sweater
Dress
Blouse
Skirt
Jacket

Date **TOTAL**

TKV-408 Stry-Lenkoff Co. Louisville, Ky., Printed in U.S.A.

Promised **Price $**

9893

IMPORTANT
SAVE THIS RECEIPT AND AVOID DELAY WHEN CALLING FOR GARMENTS

NOT RESPONSIBLE FOR GARMENTS LEFT OVER 30 DAYS

WED THUR FRI SAT ONE HOUR
10 11 12 PM 1 2 3 4 5 6 SERVICE

TOTAL

Stry-Lenkoff Co., Louisville, Ky., Printed in U.S.A.

9893 9893 9893

9893 9893 9893 9893

22.48

Figure 9-2.—Drycleaning list.

tags that are part of the drycleaning list is as follows:

1. Detach and safety pin or staple one tag to each article presented by a patron. If a patron has three articles, fasten a detachable tag to each item and leave the remaining tags attached to the master drycleaning list.

2. When you assemble the items that have been drycleaned, the count of the remaining tags confirms the number of articles the customer has brought in. Thus if five tags remain, he brought in three articles.

COST COLUMNS.–The cost columns that are located on the right side of the list are necessary only when a charge is made for drycleaning.

RECEIVING AND IDENTIFYING

Two methods for receiving and identifying drycleaning are discussed briefly below. Use the one which best fulfills your needs. Revise as necessary.

METHOD A.–Each patron fills out the list, removes the receipt stub at the bottom, and attaches the list to his bundle. The receiving clerk then tags each article in the bundle with a section of the premarked tag and staples the master(s) of the tag set and unused tags to the patron's drycleaning list.

METHOD B.–Receiving clerk prepares an original and one copy of the drycleaning list, gives copy to the patron, and puts original with articles to be cleaned.

INSPECTING AND CLASSIFYING

Inspect each article received for detachable uniform insignia and for items in pockets. Removal of ball pens, crayons, lipsticks and other foreign objects at this point will eliminate sources of damage to loads of clothing being cleaned. Put such items in an envelope and attach it to the patron's drycleaning list. Return pockets to proper position before cleaning. If you find spots on an article, send it to the spotter. Spots should be removed from the article before it is cleaned.

If time permits, determine whether any buttons or buckles are missing or loose, and note tears or any other marks. Note whether the article has a belt. Care in preliminary examination will avoid trouble later.

The two most important things to consider when items are classified for dry cleaning are: (1) color, and (2) lint quality of the material. With the standardization of Navy uniforms it will not be necessary to classify uniforms for drycleaning.

There may be occasions when you need to group flight clothing and Marine uniforms. Classify table covers, drapes, flags, and so on, according to color, material, and lint quality. (Put ties into separate bags and clean them with the blue uniforms.)

Foul weather jackets, face masks, winter helmets, and winter trousers may be cleaned together.

Although they have many different colors, signal flags may be cleaned in the same group. Transfer of lint among flags is not detrimental to their use.

Do NOT dryclean impregnated, rubberized or oiled articles, or articles manufactured wholly or in part from leather. Drycleaning solvents damage such materials beyond repair or use.

When articles are classified, divide them into equal units for loading into the drycleaner washer-extractor. The weight units should be based on the manufacturer's recommendations for machine capacity.

A record of pounds cleaned and number of loads cleaned daily is maintained to determine the numbers of pounds cleaned per gallon of solvent and the cost per pound cleaned. The use of one gallon of perchlorethylene solvent to clean 200 pounds of clothes is considered good usage. One gallon of valclene (fluoro-carbon) solvent to clean 450 pounds of clothes is also considered to be good usage.

PRESPOTTING

Before drycleaning, all articles should be examined for spots, and all spots that are discovered should be analyzed and given appropriate treatment.

Study the spot carefully to determine what substance caused it, because this will determine what spotting agent and what methods should be used in removing it.

Treating the spot may not always remove it entirely but usually should break it up sufficiently that it will come out completely during the cleaning process.

You will note that the flow chart (fig. 9-1) shows both prespotting and post-spotting steps. The latter step is necessary in case anything has been missed earlier. If, however, it is necessary to post-spot an article, it must go back to be re-cleaned so as to remove the chemical used in spotting.

A detailed discussion of spotting is given in chapter 10.

DRYCLEANING EQUIPMENT

Drycleaning, in spite of its name, is a washing process. Steps in the process are roughly similar to those for washing with water, but the differences are important.

The clothes are washed in a washer-extractor adapted to the use of a solvent other than water. Soaps are used, but these, too, are of a special kind, suited to the solvent. The washing, rinsing, extracting, and drying processes all take place, but all are different from those in water washing.

WASHER-EXTRACTOR

Several types of drycleaning washers are in use currently aboard Navy ships. In general, they are of two types: (1) those that perform only the washing and extracting, after which the load is removed to a tumbler for drying, and (2) those designed to perform the complete cycle of washing, extracting, and tumble drying.

The fact that heat is necessary to the drying process has given to this second type of unit the name "hot unit," while the first type of washer-extractor is conversely described as a "cold unit." Safe operation requires that only a nonflammable solvent be used in the hot type. Some of the cold type units use petroleum solvents. However, regardless of the type used, petroleum solvents are no longer authorized for use on board ship for drycleaning purposes.

Each type has its advantages. The hot unit simplifies the job by eliminating handling of the clothes from one machine to the other. This type of unit also requires less space, which is an advantage aboard ship. The fact that the hot unit uses only nonflammable solvent also makes it preferable afloat.

For a large plant, however, or one with a very heavy workload, the hot unit is too slow because of the length of run required for drying. In plants where the workload creates a tight time schedule, therefore, separate machines for washing and for drying can be used with greater efficiency than can the hot unit type.

Figure 9-3 shows a shipboard drycleaning plant with a cold unit and a tumbler. The washer-extractor is on the left. Figures 9-4 and 9-5 are front and rear views of a hot unit.

Drycleaning machines of both types that are presently being installed on board ship are completely automatic; that is, controls are set at the beginning of the run so that the machine carries out its complete cycle of operations without further action by the operator. This makes your work easier than with the older type of machine, but it is still necessary that you understand what takes place so that you will know what to expect of the machine and how to troubleshoot if necessary.

Figure 9-3 shows the three main parts of the washer-extractor most clearly. They are (a) the washer itself, (b) the filter, and (c) the distilling unit.

Basically, what happens in all the automatic machines is this:

1. The load is placed in the washer basket, where solvent, aided by soap and the motion of the machine, carries on the initial washing process.

2. The solvent travels in a cycle through the washing basket into the filter–where much of the impurity it has collected is removed–and back into the washer, where it rinses the load.

3. A portion of the solvent is drained off after passing through the filter. This solvent enters the distilling unit, where it is completely

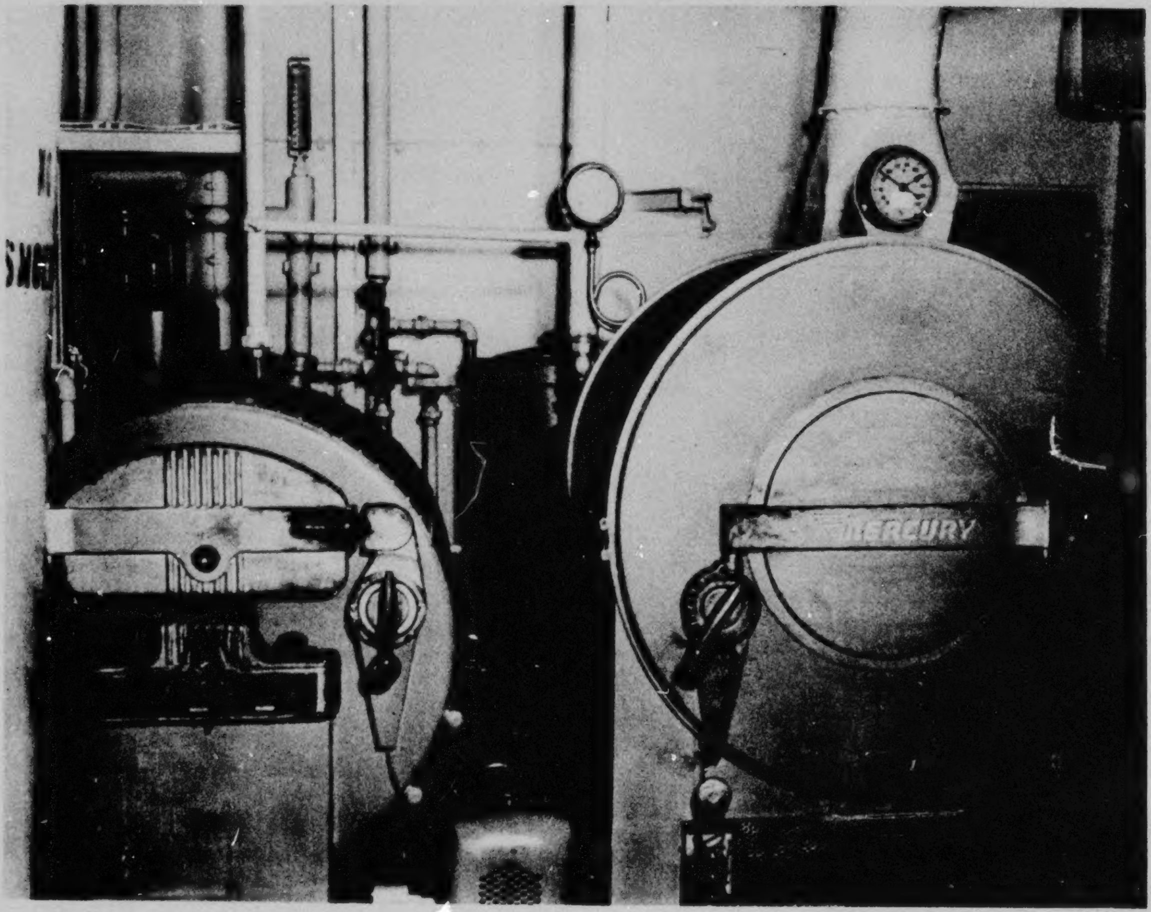


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Figure 9-3.—"Cold" type of drycleaning unit.

purified. This is done by heating it until it vaporizes. The vapor is then run over cold pipes to lower its temperature rapidly and return it to a liquid state. After distilling, the solvent again enters the washing cycle. By this means the total amount of solvent in the machine is maintained at an acceptable level of purity for a long time. Some machines have stills that operate separately, in which case, the entire amount of solvent in the machine is run through the still during a period when the washer is not in operation.

4. At the end of the washing-rinsing period, the flow of solvent is automatically shut off and the machine spins to extract the solvent from the load.

These four steps complete the cycle of the cold unit; whereas, the hot unit then continues with the tumbling and drying.

Each model of washer-extractor has its own manufacturer's technical manual, a copy of which should be available for your study and use as a reference in operating the machine. These manuals give detailed instructions about loading and starting the machine and other steps the operator needs to know. Do not attempt to operate any machine without these specific instructions.

DRYCLEANING SOLVENTS

Only synthetic solvents are authorized on board Navy ships for use in drycleaning plants. The most commonly used solvent is perchlorethylene/tetrachloroethylene, the only solvent recommended for use in the Vic Model 22C0 drycleaning machine.

Solvent is taken aboard in large drums. The washer-extractor is filled with solvent by personnel from the engineering department. Eventually, through use, the solvent in the machine reduces below the level necessary for operation. Before adding solvent, check carefully to see if the solvent in the system should be distilled. You must have clean solvent to produce clean clothes. You should check the amounts in the storage tank from time to time and ensure that it is refilled as necessary. It is normally necessary to remind the sales office when the quantity of solvent is reaching a level at which procurement of a new supply should be initiated.

The Turboclene drycleaning machine uses Valclene drycleaning solvent. Valclene is a drycleaning fluid that is based on a fluoro-carbon solvent with a built-in detergent additive. Valclene has a high rate of vaporization and a low boiling point which permits rapid drying at room temperatures plus distillation. This eliminates the need for recovery tumblers to dry garments and recover solvent vapors.

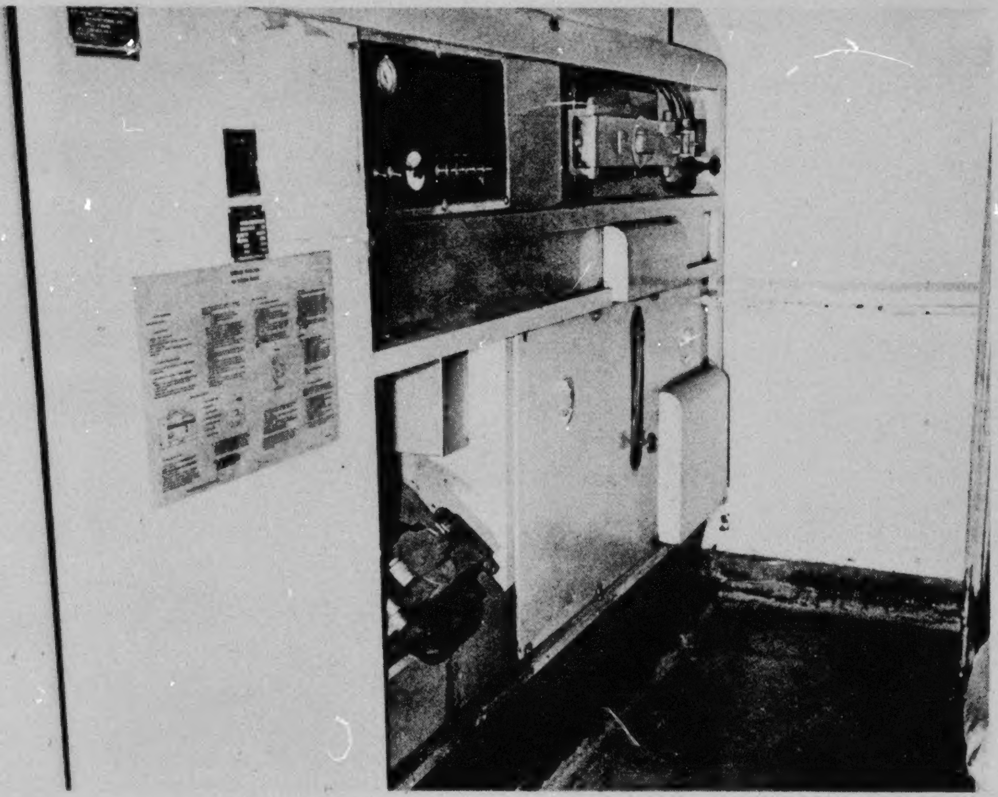

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Figure 9-4.—"Hot" type of drycleaning unit (front view).

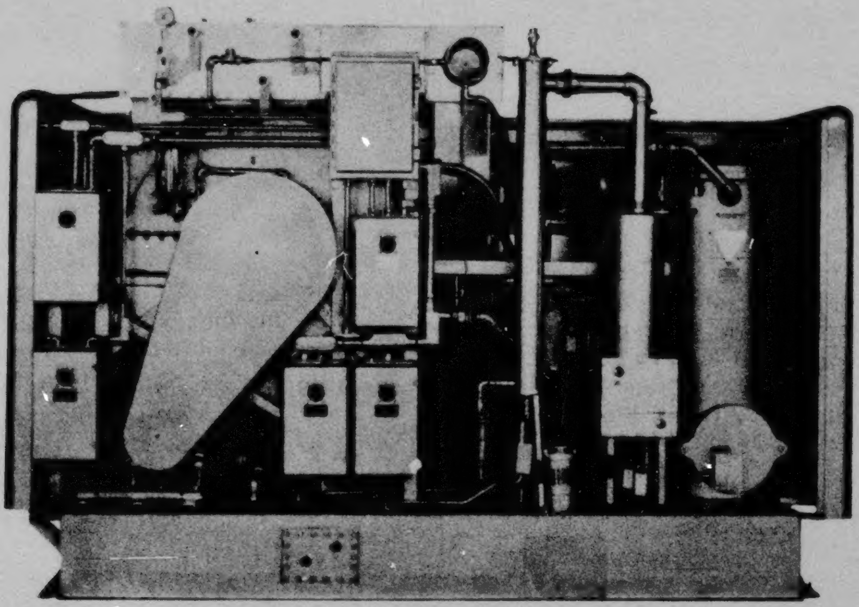

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Figure 9-5.—"Hot" type of drycleaning unit (rear view).

Although Valclene is far less toxic than perchlorethylene, you should still observe safety precautions regarding ventilation of drycleaning spaces.

Note: Never use flammable petroleum distillate drycleaning solvent conforming to specification P-D-680 or other flammable solvents in shipboard drycleaning plants.

SOAPS FOR DRYCLEANING

Soap is used with both synthetic and petroleum solvents. Soap is added to the solvent to assist in stain removal and to enable the addition of controlled amounts of moisture. Each manufacturer of soaps furnishes detailed instructions as to its use, and a test kit, to ensure the proper ratio of soap to solvent. The stocking of specific soaps requires close cooperation between you and the sales office, to ensure proper levels of supply on hand.

Avoid using more than the required amount of soap. Otherwise, you will produce two results, both undesirable: (1) you will unnecessarily increase the cost of cleaning operations (Remember, this reduces ship's store profits which provide the recreation fund.); (2) you will actually produce a less satisfactory cleaning job. Excess soap increases the amount of fatty acid in the solvent so that it does its job less effectively.

PRECOATING FILTERS

In the filter unit, the solvent is forced through a series of screens which have been coated with filter powder (diatomaceous earth). This powder is highly absorbent and has the capacity of removing very fine foreign substances from the solvent, leaving it relatively clean when it leaves the filter.

Before operations begin each day, the screen must be freshly coated with filter powder. This is done according to the directions provided in the manufacturer's technical manual for your particular machine.

At the end of the day's operations, while the machine is being cooled down, the filter can be shaken down, following the manufacturer's directions. The sediment is allowed to settle in the filter until morning.

During long continuous operation, the impurities absorbed by the filter powder may contaminate it so that the solvent no longer passes through as easily as it should. This creates too much pressure in the filter, causing the machine to operate with reduced effectiveness. To avoid this situation, it may be necessary to shake the filter down during operation. Consult the technical manual for directions.

After the filter pre-coat has been applied and after the solvent shows clear in the sight glass, activated carbon should be added to the solvent and circulated through the system while no garments are being cleaned. Activated carbon is useful in removing color and other impurities from the solvent. Each manufacturer of activated carbon (trade names, Darco, Norit, Klean, and others) furnishes detailed instructions for its use.

OPERATION OF STILL

Whether the still operates automatically or not, be careful to see that it is working properly and that instructions in the manufacturer's technical manual are followed precisely. Otherwise, you may be in serious trouble before you know it.

The vapors from perchlorethylene are toxic, and even the small amounts that arise through incidental evaporation from the washer can accumulate until they pollute the air in drycleaning spaces, with the result that operators begin to feel sick and dizzy and to lose coordination. The still can create a more serious hazard because it is constantly converting quantities of solvent into vapor for the purpose of purifying it. If the machine is working properly, the cooling system promptly reconverts this vapor to liquid. If, however, the cooling system becomes faulty or ceases to operate, the vapor will build up pressure inside the distilling unit and eventually will escape into the air in amounts sufficient to be seriously harmful or even fatal to operating personnel. It is therefore essential that you check the still frequently when it is operating to see that the cooling system is working properly.

Note: For the above reason, it is extremely important to keep drycleaning spaces properly ventilated.

TUMBLING AND AERATING

Whether the drying step takes place in the same machine (hot type) or in a separate tumbler (cold type), the process is essentially the same.

In addition to fluffing and drying, the drycleaning tumbler must also deodorize. Many conditions govern the time required to deodorize, and it is therefore impossible to predetermine the tumbling time required for each load. Steam pressure, room temperature, exhaust duct installation, types of garments, and condition of solvent are some of the factors to consider. Silks deodorize faster than woolens, woolen coats with shoulder padding deodorize slower than trousers. Experience will be the best guide.

Precautions to Protect Fabrics

In tumbling especially, but also in all other phases of drycleaning, all personnel should remember that they are handling special fabrics and special garments. These articles are drycleaned because of this special fabric or special construction. Therefore, drycleaning personnel must never forget that excessive mechanical action, excessive heat, or excessive moisture applied during any phase of the drycleaning process may shrink or damage the fabric. What is desirable for one fabric may be excessive for another. Know your drycleaning formula and the manufacturer's technical manual thoroughly and apply that knowledge to the special handling of each individual type of clothing. Time of run and amount of heat are of great importance in any operation.

Steam is used to provide the necessary heat in the tumbling operation. Steam coils warm the flow of air in the tumbler. If this flowing air is heated above 140° F, which is sometimes desirable, and there is an appreciable amount of moisture present in woolen garments, it will cause objectionable shrinkage. This moisture may be present from two sources. One is high humidity in the atmosphere; the other is excessive water in the drycleaning soap solution.

The tumbling operation in drycleaning is normally done in three steps. The following table represents average tumbler operation during the three steps for the three basic material groups based on construction of fabric only.

1. Silks and whites.	Five minutes cold; dry at low temperature (120° F); finish with five minutes cold.
2. Soft woolens and drapes.	Five minutes cold; dry at 140° F; finish with five minutes cold.
3. Tightly woven woolens.	Five minutes cold with steam; dry at higher temperature (160° F); finish five minutes cold or five minutes cold with steam.

Ventilation

Because of the noxious fumes from synthetic solvents drycleaning tumblers are equipped with many safety features. The operator must become thoroughly familiar with the manufacturer's technical manual in this respect, and should make a careful check of these safety features periodically to ensure safe operation. Thorough ventilation of the drycleaning spaces is essential as a protection for operating personnel.

When you start to take clothes from the tumbler, check them for odor. If you still detect the solvent odor, continue tumbling long enough to eliminate it.

POST TUMBLING INSPECTION AND SPOTTING

After tumbling, check each article for spots and other imperfections. Have spots removed by the spotter. Remember, however, that articles spotted at this stage MUST BE FLUSHED OR RECLEANED to remove spotting chemicals.

Never press clothes with spots in them, for the heat used in pressing will so set the stains that removal will be difficult—if not impossible.

Clothes passing this inspection should be hangered immediately to avoid unnecessary wrinkling. Drycleanable items of apparel are generally made of wools, permanent press, blends, and double knits that have "easy care" characteristics and proper care at this point can eliminate in many cases, the need for additional pressing or require only steam chamber finishing that is discussed later in this chapter.

OPERATION OF DRYCLEANING MACHINES

Drycleaning machines discussed in the following paragraphs are representative of those being used on board Navy ships.

VIC DRYCLEANING MACHINE MODEL 22C0

The VIC model 22C0 is one of the most popular hot drycleaning machines in use on board Navy ships. The VIC drycleaning machine uses ONLY perchlorethylene cleaning solvent. The total amount of solvent that is required for operation of the VIC model 22C0 is 135 gallons. The capacity of the machine is as follows:

- Storage Tank—105 gallons
- Filter—65 gallons
- Washer Housing to Overflow Line—39 gallons
- Still—10 gallons

Filling the Machine With Solvent

The solvent for filling the machine is added through the strainer housing. See the operational diagram illustrated in figure 9-6. The procedure for filling the machine with solvent is as follows:

1. Screw the barrel pipe assembly into the side opening of the drum.

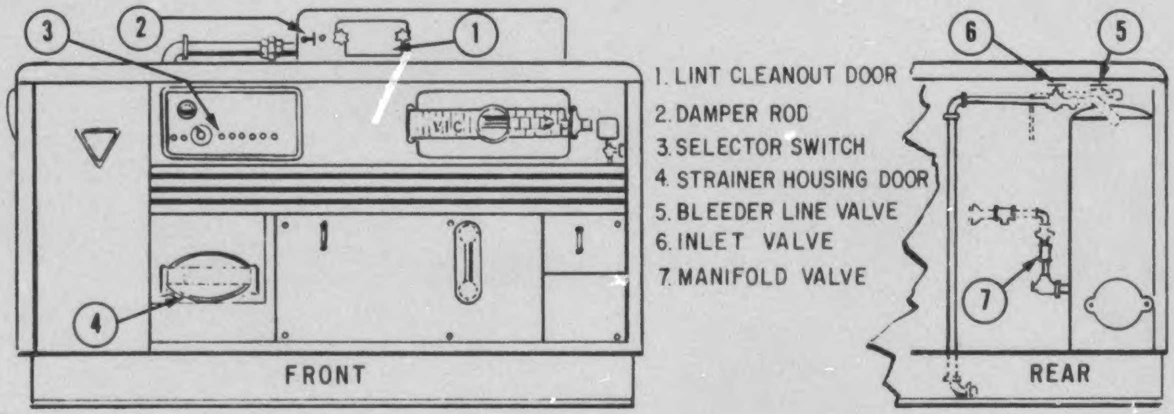

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Figure 9-6.–The VIC drycleaning machine operational diagram.

2. Connect the three quarter inch flexible hose to the fitting on the barrel pipe assembly; insert the other end into the strainer housing.

3. Connect an air line supply of no greater than twenty pounds per square inch pressure to the one quarter inch fitting on the barrel pipe assembly. The pressure in the drum is controlled by the relief valve on the barrel pipe assembly.

CAUTION: This relief valve is pre-set for a seven and one half pound per square inch pressure and must not be adjusted.

4. Before the solvent reaches the desired level in the storage tank, shut off the air supply, as pressure builds up in the drum the pressure will continue to force the solvent out to the storage tank, until the pressure equalizes itself in the drum.

5. Fill the storage tank of the machine with two drums of solvent or approximately 100 gallons.

6. Flip the selector switch on the panel to "manual" operation; switch the inlet and drain valve to "manual" operation.

7. Open the bleeder line on top of the filter, open the inlet valve between the pump and the filter, open the manifold valve at the filter outlet.

8. Flip the pump switch to on position. The solvent will now flow into the filter and circulate. When a full stream of solvent is being expelled from the bleeder line, shut off the bleeder valve.

9. Shut off the pump switch and shut off valve between the pump and the filter.

10. Add the solvent to the storage tank until the solvent is within two inches of the bottom of the strainer screen.

Pre-Coating the Filter

Follow the instructions noted below when you are pre-coating the filter.

1. Flip the selector, inlet and drain switches to "manual" position.

2. Weigh out six pounds of filter aid and add into the strainer basket.

3. Open the valve between the filter inlet and pump.

4. Switch the pump to on position. The solvent will now flow from the filter, through the washer and out of the drain, washing out the filter aid from the strainer, down to the pump and pre-coating filter.

5. Allow the solvent to run in this manner for five minutes or till the solvent shows clear in

the sight glass. When the solvent in the sight glass appears clear, flip the selector switch to off position, but leave the pump on continuously through the balance of the day's run. If the pump is stopped for some reason, a full pre-coat will be required.

Loading Garments Into the Machine

When loading garments into the machine proceed as follows:

1. Weigh two bundles of garments to an equal weight, not to exceed 15 pounds each. Keep in mind, some garments weigh more than others when soaked with solvent; consequently, try to distribute a like number of similar garments in each compartment.
2. Open the damper by pulling the damper handle out from the machine. The loading door will not open if the damper is shut. When the loading door is open, the fan will automatically start.
3. Flip the washer switch to automatic position and open the loading door. The basket can be inched into position by depressing the button inside the door lock safety switch. See figure 9-7.

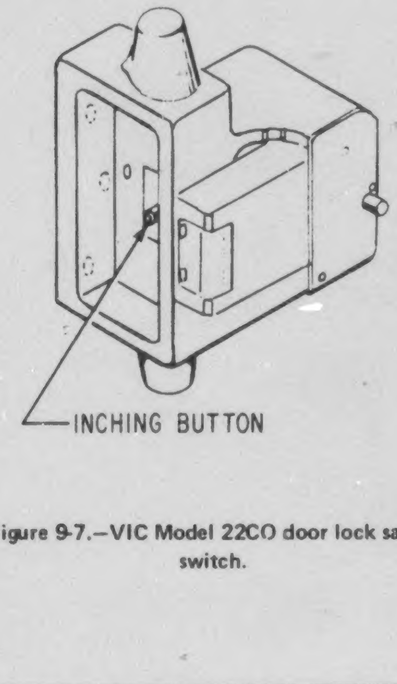

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Figure 9-7.–VIC Model 22CO door lock safety switch.

4. Load an equal weight of garments in each compartment of the washer, making sure the basket doors are firmly locked.
5. Lock the loading door, close the damper, and flip all switches to automatic position.
6. Set the timer for the desired time of the wash run, then add one half pound of filter aid to the strainer housing. Add one half pound of filter aid to the strainer housing for each load run. The machine will now go through the complete cycle automatically. It will wash, drain, extract, tumble and recover solvent from the garments and signal, indicating the end of the automatic cycle and the time to unload cleaned garments.
7. Open the damper.
8. Open the loading door and inch the compartment door into position.
9. If there seems to be an odor present, with the compartment doors closed, depress the inching button momentarily; this will aerate the garments and remove the odor.
10. Open the compartment door, remove the cleaned garments and insert the garments to be cleaned; then inch into position to remove the garments from the second compartment, inserting balance of the garments for the next load to be cleaned. You are now ready to set the timer, add the filter aid, and resume operation. If additional time is required for any operation, the timer can be re-set by turning the indicator back clockwise.

SETTING STEAM PRESSURE AND WATER TEMPERATURE

With the steam open to the coil and the garments in the machine for recovery, set the steam pressure to the recovery coil as follows:

1. Release the jam nut on the adjusting screw of the steam pressure regulator.
2. Turn the adjusting screw clockwise to increase and counterclockwise to decrease the steam pressure.
3. Set the steam pressure at fifty-five pounds per square inch on the pressure gage, when solvent recovery is in operation with the garments in the cylinder.

Water should be under pressure of at least thirty pounds per square inch and no more than

75° F under these conditions. The pressure and temperature may vary, providing the water temperature can be kept to a temperature of 80° F or under on the outlet side of the cooling coil.

The outlet temperature of the water is set by the throttling valve in the outlet water line. After the machine has been in operation for ten minutes, proceed as follows:

1. Open the water inlet valve to full port opening.
2. Open the outlet valve partially.
3. Check temperature of the outlet water on the thermometer and adjust till the outlet water shows about a ten degree rise over the inlet water.
4. Check the outlet temperature several times during the first three loads run.

NOTE: Once the desired outlet temperature setting is acquired, the throttling valve should remain in this permanent setting.

STILL.–The steam pressure required on the cooker coil will be between thirty-five and forty pounds per square inch to start, with the cooker filled with solvent. The proper pressure will be determined during the operation of the still; this depends on the conditions existing in the individual operation.

The outlet water adjustment on the still is achieved in the same manner as on the recovery coil, except that the outlet temperature of the water is adjusted to 120° F or more.

Using Soap

When you choose to use the batch soap run, proceed as follows:

1. Load the machine in the normal manner.
2. Place the selector switch in "automatic" position.
3. Place the soap stock solution in the dispenser.
4. Place the dial in "wash" position.
5. Allow the soap from the dispenser to run into the washer.
6. When the solvent level desired is reached, turn the dial indicator clockwise to thirteen, or under. Any amount over eight that the timer indicator is set for, will regulate the length of the soap run.

Note: Consult the soap supplier for the time formula.

Shutting Down the Machine

In order to prevent moisture accumulation in the machine over-night, the machine must be cooled down. The cooling down process is accomplished as follows:

1. After removing the garments from the last load of the day, close the loading door and the damper.
2. Place the selector switch in "manual" position, switch on the washer and fan switch.
3. Shut off the steam to the recovery coil.
4. Run the machine in this manner for five minutes. This will condense the remaining fumes.
5. Return the selector, washer and fan switches to off position, and shut off the water.
6. Remove the lint cleanout door. Clean the lint out of the lint bag and hang the bag up to dry. (Replace with a clean lint bag when starting the machine the next day.)

Shake Down the Filter

The filter should be shaken down after each day's cleaning. For best results, proceed in the following manner:

1. Shut off the pump switch.
2. Shut off the filter manifold valve.
3. Open the bleeder valve on top of the filter for fifteen seconds.
4. Shut off the bleeder valve.
5. Flip the shaker switch on for five minutes.
6. Shut off the shaker switch and allow the sediment to settle in the filter until the following morning.

If the filter pressure gets too high during the operation, shake down the filter as directed, just after the washing operation. The filter can settle out during the recovery cycle. Be sure to pre-coat the filter after every shake down.

Operation of the Still

The still should never be started until the filter has been allowed to pre-coat. Then proceed as follows:

1. Open the one quarter inch filler valve to the by-pass line.
2. Open the one half inch filler valve to the still cooker chamber. The still will now fill to the proper height, keeping a constant level. If the cooker does not get full of solvent, the cooker is air-bound; open the drain valve to bleed.
3. After the solvent fills the cooker, open the steam valves slowly.
4. Open the inlet water valve to full port opening.

Never turn the steam on to the cooker coil when there is no solvent in the still. Always be sure the water is turned on to the condenser before turning the steam on to the cooker.

WHEN AND HOW TO DRAIN OIL FROM THE STILL.—The residue and oils from the still should never be drained oftener than necessary. This can cause extensive loss of solvent if not allowed to build up to the proper level. A good gage to use is to cook down the residue and oils after cleaning eight hundred pounds of garments with the still on continuous operation. Proceed as follows:

1. Close the filter valves.
2. Keep the cooker operating.
3. When no more solvent drops through to the separator, shut off the steam and drain the remaining residue and oil and discard. This draining should be done while the cooker is hot, as it has a tendency to thicken, cake and congeal if allowed to cool, causing poor drainage and coating the cooker coil.

If, after draining, the still does not seem to cook at a desired rate of flow, it means there is an accumulation of muck in the bottom of the cooker, possibly covering the cooker coils. This will require removing the coil plate and cleaning out the sludge from the bottom of the cooker. At this time, clean the coils with a good stiff brush. Arrange to have spare gaskets on hand to ensure leaf proof closure of the coil plate after cleaning.

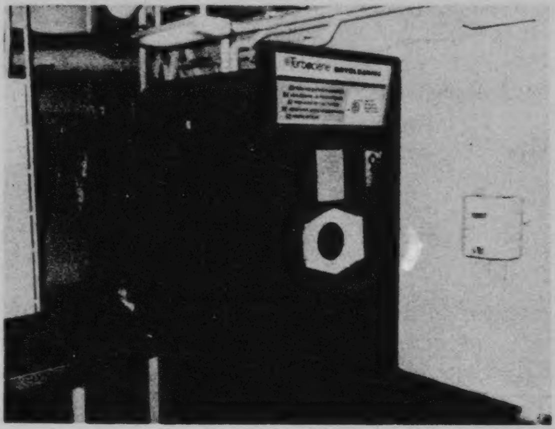

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Figure 9-8.—Turboclene drycleaning machine.

TURBOCLENE DRYCLEANING MACHINE MODEL FDC-4

Another drycleaning unit that the Navy has installed on board some Navy ships is the Turboclene Model FDC-4 (fig. 9-8). It is a compact system which uses Valclene drycleaning fluid. It is a hot type machine which carries on its various functions in a manner slightly different from that described earlier. Clothes are first cleaned in drycleaning fluid. After draining and extracting the solvent from the clothes, a vacuum is used to remove the remaining solvent. The cleaning solvent is completely distilled after each cycle to provide clean pure solvent for the next load. Hot water is circulated through a coil in the still to heat the solvent. The solvent vapors are condensed in the water cooled condenser and stored in the storage tank for the next cycle. Efficient solvent recovery is achieved by passing all solvent laden air through a low temperature refrigeration system. Valclene 350, a solvent detergent solution, is automatically added to the cleaning solvent each cycle, to provide the correct mixture for proper drycleaning.

Turboclene Operator's Instructions

The *NAVSEA Technical Manual* furnished with the equipment, together with the operating instructions on the front panel sign, provide the operator with sufficient information to safely and economically operate and maintain the turboclene drycleaning machine.

The daily and weekly check lists outlined in the *NAVSEA Technical Manual* furnished with the equipment must be followed carefully to assure continuous high performance.

DRYCLEANING PRESSES

Drycleaning presses have perforated metal heads and bucks through which steam is admitted by the operator. The heads are normally covered with a perforated, thin, metal mask, which is sometimes also covered with a moleskin type of fabric to prevent a gloss on pressed articles. The bucks are usually padded and are then covered with a perforated metal mask and a cloth covering.

Presses used for drycleaning are operated either manually or by compressed air. Air operated presses have control buttons on the left and right sides of the table. When the operator lifts the operating handle and at the same time presses the left hand control button, he admits compressed air to the pneumatic system which lowers the head on the buck. He can release the head by depressing the right control button. Figure 9-9 illustrates a typical drycleaning press that is installed on board Navy ships.

These presses also have vacuum lines connected with the heads and bucks to remove steam from the pressed article. When the steam vapor is removed, the heat of the press dries the article faster and helps to remove wrinkles and retain smoothness and creases.

STEAM PRESSING

The pressing of woolen uniforms should not be done on HOT HEAD presses (uncovered polished steel). Woolen fabrics cannot withstand high temperatures.

Steam lines under no more than 75-80 pounds per square inch pressure should be connected to drycleaning presses. At this pressure the proper amount of moisture and heat is available to properly press the item of apparel.

CAUTION is required in the pressing of fabrics containing high percentages of either DACRON polyester fabric or ORLON acrylic fiber, because control of temperature, pressure, and time are important. For best results 100 percent Dacron or Orlon fabrics should be pressed at temperatures around 275° F with low mechanical pressure and short intervals of time. In blends of Dacron with wool, higher temperature may be used provided the mechanical pressure and contact time are kept at a minimum. Improper pressing techniques may result in shine, watered, clouded, or frosted appearance, needle holes, and difficulty in altering the finished garment at some later date. If high steam pressures are used, it is doubtful that pressed seams can subsequently be altered. Permanent damage results from the defects discussed above, as they cannot be removed by sponging or other treatment.

PRESS LAYS

In machine pressing, each garment is finished by a series of lays. Each lay is a position of the garment on the buck, and the series should cover the entire garment. Places on the garment which cannot be pressed with the machine should be smoothed out by inserting a puff (pad) and pressing the spot against the head of the press or by using a hand iron.

All pressers do not follow the same pattern for pressing the same article. Generally, however, there is not much variation in different lays. Sequences of lays for trouser tops and legs and sack coats are described in the following pages. The ones given are considered the

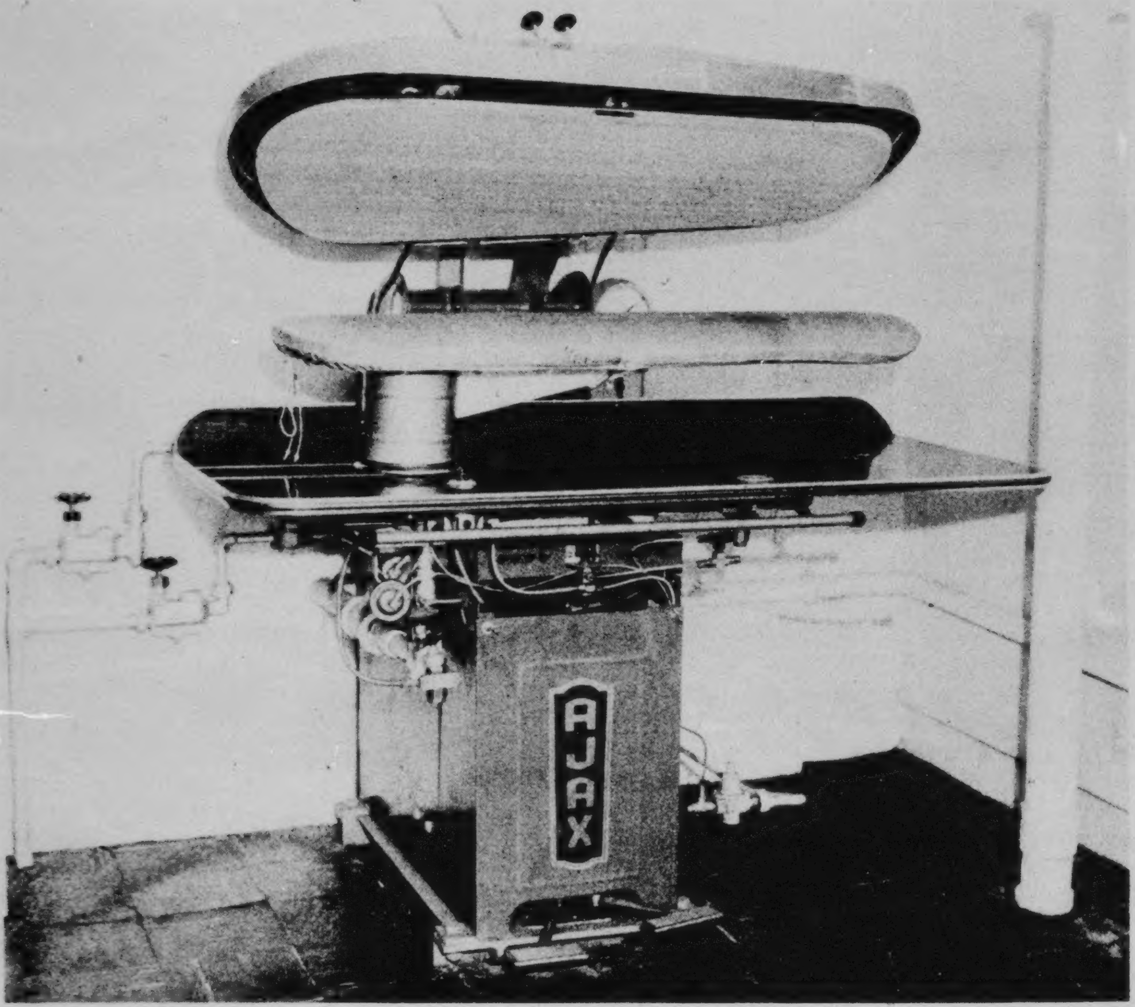

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Figure 9-9.—Drycleaning press.

minimum for each article when high quality pressing is desired.

PRESS LAYS FOR TROUSER TOPS

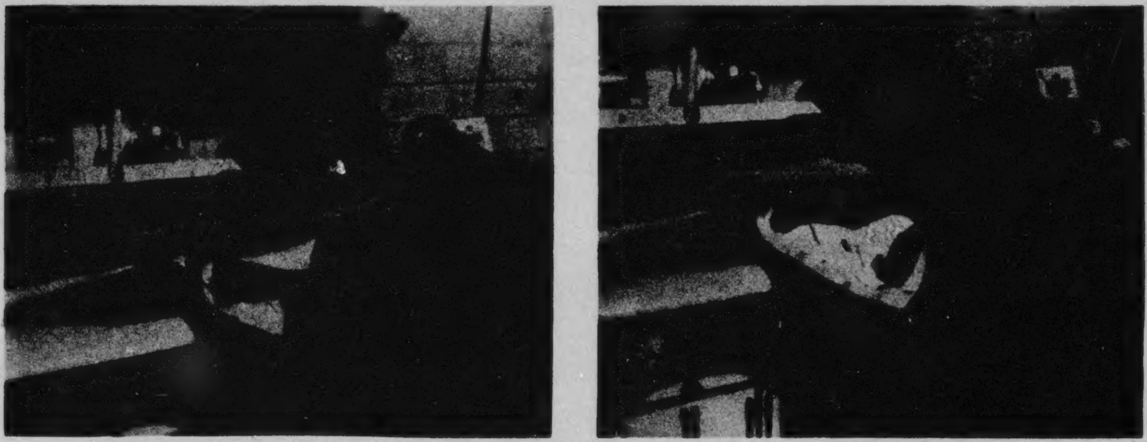
Illustration 9-10 gives the sequence of lays for pressing trouser tops.

With the fly open (lay No. 1), draw the left trouser top over the small end of the buck, having the fly front almost even with the front edge of the buck. Steam by using the head and applying light pressure, then dry thoroughly with the vacuum.

Again place the left trouser top on the small end of the buck as shown in lay No. 2. The pocket should be in the center of the buck. Straighten out the pocket and make certain that the outer edge is even and drawn together. Steam, press, and dry the lay.

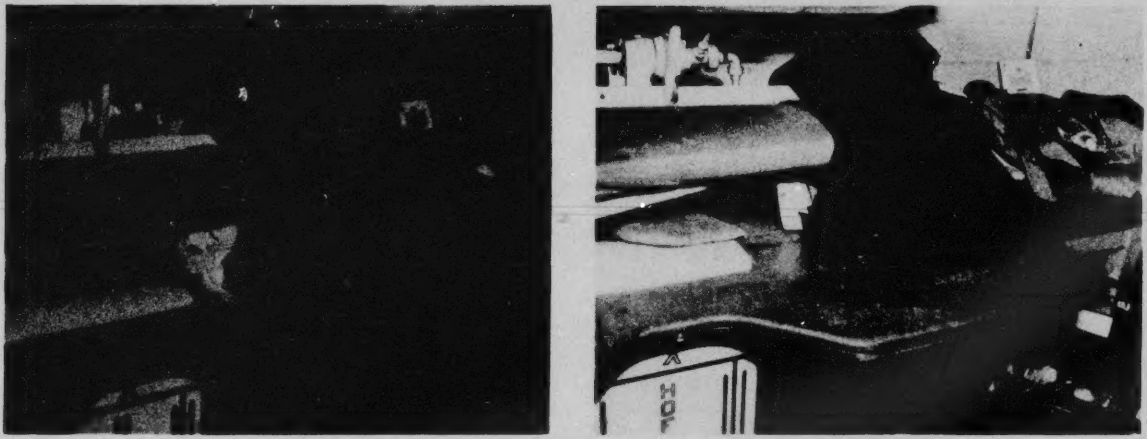
In lay No. 3, the left side pocket is even with the front edge of the machine and the back center seam is even with the rear edge of the buck. The left hip pocket lies in the center of the buck. Steam the material lightly and pull the pocket together.

In making lay No. 4, draw the trouser top over the small end of the buck so that the end of the buck fits well down into the seat of the trousers and the back seam is directly in the center of the buck. Apply steam and light pressure and vacuum dry.



LAY 1 – LEFT FLY FRONT

LAY 2 – LEFT SIDE POCKET



LAY 3 – LEFT HIP POCKET

LAY 4 – CENTER SEAM

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Figure 9-10.—Lays for pressing trouser tops.

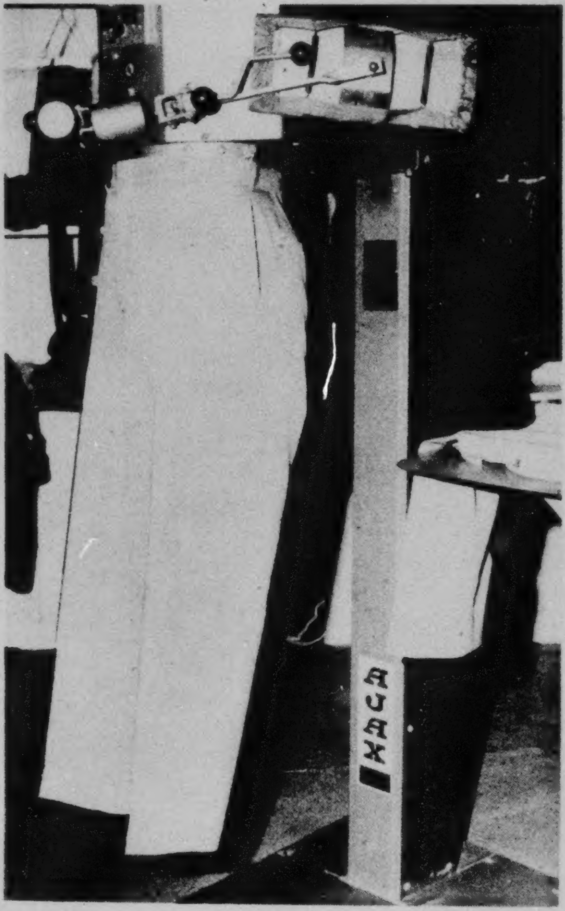

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Figure 9-11.—Automatic topper press.

In making lay Nos. 5, 6, and 7, continue on around the trouser top, pressing the right side. These lays are not illustrated as they correspond closely to lays 3, 2, and 1.

When available, the automatic topper press may be used to press trouser tops. The topper press eliminates the need for lays discussed above and also speeds up production. Figure 9-11 illustrates an automatic topper press.

TROUSER LEGS

Lays for pressing trouser legs are given in figure 9-12. The first step is to place the front portion of the left leg on the buck—crotch at the large end, the inside of the leg facing upward, the seams lying on the center of the buck (see lay No. 1). Ensure that one seam rests upon the other for the entire length of the leg. Apply steam to soften the material, and straighten the knee.

Lay the left leg, as shown in lay No. 2, on the front of the buck so that the front crease is in the center of the buck and the top of the trouser is at the large end of the buck in a line with the second or third button of the fly (or, if zippered, 2 or 3 inches from the bottom), in position so the crease will extend upward as far as possible.

In lay No. 3, move the trouser leg to the rear of the buck so that the back crease is lying on the center of the buck. The leg should be placed so that at least 4 inches of the seat will be creased. Extend the crease as high as possible without wrinkling the crotch.

Lay Nos. 4 (right leg, front portion), 5 (right leg front crease), and 6 (right leg rear crease) are substantially the same as lays 1, 2, and 3 of figure 9-12.

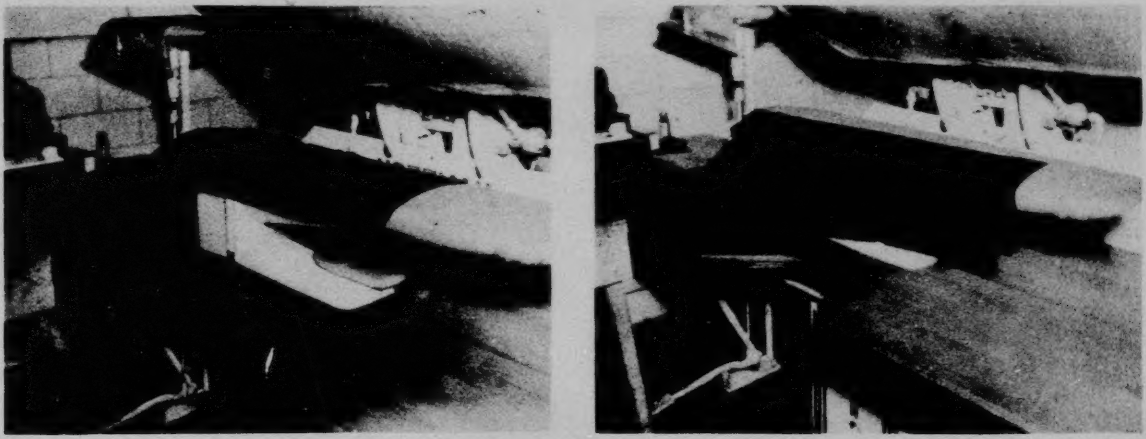
SACK COATS

Check illustration 9-13 for the lays used in pressing sack coats.

As shown in lay No. 1, place the left side of the coat collar and the left lapel on the rear of the large end of the buck, and press. This operation shrinks the collar at the gorge seam, restoring the shape of the garment where it tends to stretch, from the seam at the shoulder down to about 5 inches below the gorge seam.

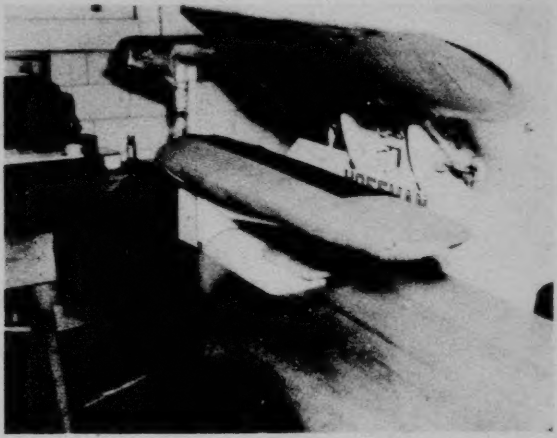
Lay No. 2 is similar to lay No. 1 except that the right side of the collar and the right lapel are pressed. Make this lay on the front of the large end of the buck. Lays Nos. 1 and 2 serve to restore the balance of the coat so that the left and right front hang evenly.

After creasing the two sides of the collar, place the collar on the large end of the buck (see lay No. 3) so that the center is on the center line of the buck. In most cases the collar is stretched while being worn. Distribute the extra fullness over the length of the collar, and steam freely.



LAY 1 – LEFT LEG FRONT PORTION

LAY 2 – LEFT LEG FRONT CREASE



LAY 3 – LEFT LEG REAR CREASE

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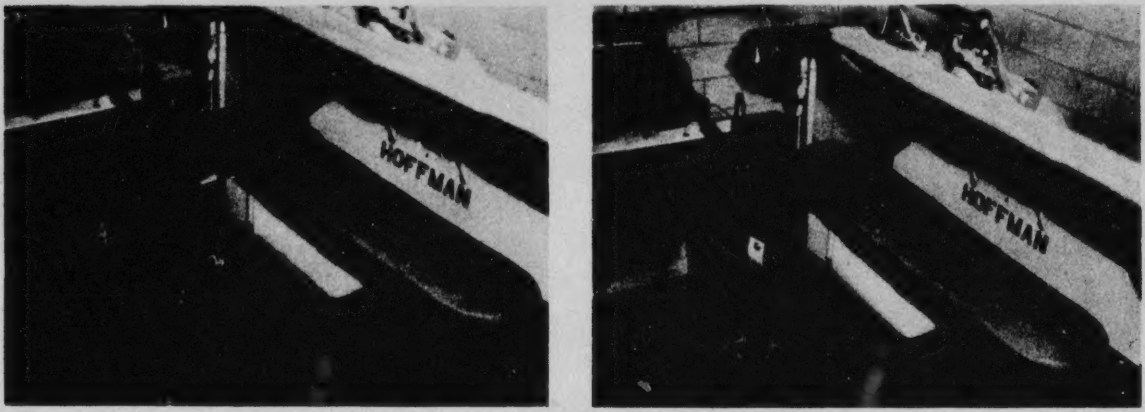
Figure 9-12.—Lays for pressing trouser legs.

In lay No. 4, place the right front of the coat at an angle in order to bring out the chest. Never stretch the front of the coat; gather in the front slightly and shrink it to the proper length. Steam well before applying pressure, then vacuum dry.

See that the pocket is smooth. Move the coat forward on the buck for lay No. 5. The small end of the buck fits into the chest about 1 inch below the armhole pit, and within 2 or 3 inches of the side seam. (See illustration.) Any fullness on the dart seam should be taken in between the pocket and the armhole pit.

In lay No. 6, place the right half of the back on the buck so that the lay is about 1 inch from the right armhole and about 2 inches below the collar. The side seam slants in from the armhole; the bottom of the seam is about 4 inches from the front edge of the buck.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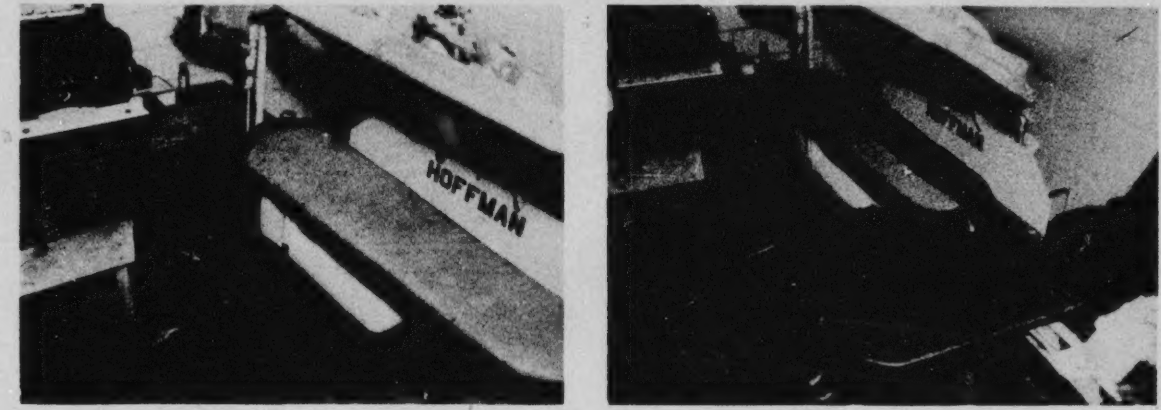
LAY 1 – LEFT SIDE OF COLLAR

LAY 2 – RIGHT SIDE OF COLLAR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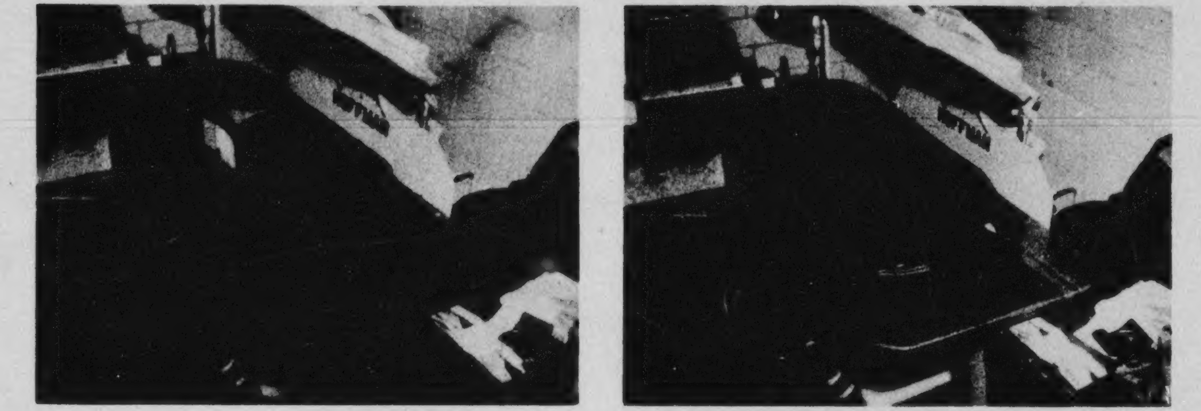
LAY 3 – CENTER SEAM OF COLLAR

LAY 4 – RIGHT FRONT EDGE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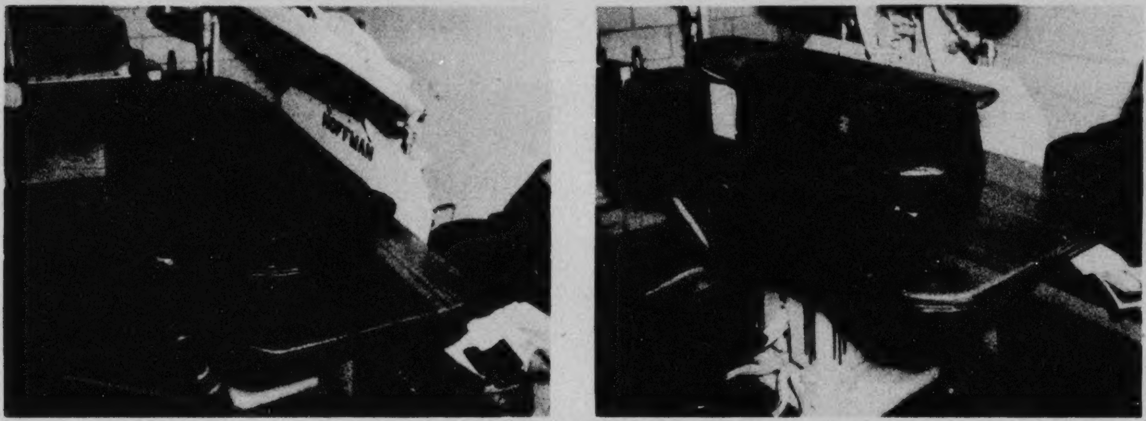
LAY 5 – RIGHT SIDE AND POCKET

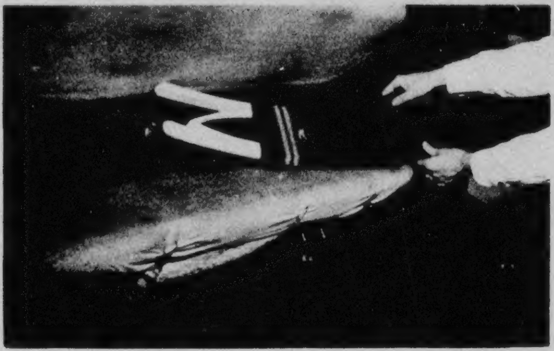
LAY 6 – RIGHT HALF OF BACK

Figure 9-13.—Lays for pressing sack coats. 119.37.1



LAY 7 – CENTER SEAM OF BACK

LAY 11 – COAT FACINGS



LAY 13 – SLEEVES, ROLLED

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Figure 9-13.–Lays for pressing sack coats–continued.

The center seam in the back of the coat should be placed in the center line of the buck for lay No. 7. See that the bottom edge of the under-collar is placed even with the edge of the buck. Any fullness in the center seam between the shoulders should be taken in.

Continue on around the coat, making lay No. 8 (left half of coat back), lay No. 9 (left side and pocket), and lay No. 10 (left front edge) to correspond to lays 6, 5, and 4.

Place the right facing of the coat front on the buck, facing up as shown in lay No. 11. This lay takes in the coat edge from the bottom of the coat to a point below the gorge seam. Lay No. 12, for the left facing, is the same as No. 11.

Insert sleeve former as shown in lay No. 13 and place on buck of press. Bring the press head down for light contact only and steam from head and buck and then apply vacuum until dry. Turn sleeve over without removing former and repeat on other side. The same methods are applied for the right sleeve. Visible creases from previous pressing can be removed by rubbing on buck and steaming with former still in the sleeve. For stubborn creases, wet with a damp cloth, allow to dry, and press as above.

Fit the shoulder pad into the sleeve head at the back seam. After spreading the fullness evenly, apply steam, then hold lightly against the head allowing the heat to press out the fullness. Next follow around to the front of the sleeve, getting in far enough to take care of the wrinkles. Work out the wrinkles in the other shoulder.

Drycleaning plants on board some Navy ships are equipped with a steam-air-finisher. Figure 9-14 illustrates a sack coat being pressed on this equipment. Additional information and operational instructions of a steam-air-finisher are discussed later in this chapter.

STEAM CHAMBER

Drycleanable items of apparel are generally made of steam finish fabrics. This includes wools, permanent press, blends, and double knits. (All of fabrics mentioned above may require different steam cycles.) The items of apparel mentioned above may be finished in several types of steam chambers with a minimum requirement for additional finishing or touch up. The operator hangers the garments and places them on hooks in the chamber and then the garments are (1) subjected to a surging of low pressure steam (with vibration) that relaxes the wrinkled fibers and (2) subjected to streams of hot air (with vibration) that smooth and dry the fabric. When the garments are taken out of the chamber they are often ready to wear without further handling.

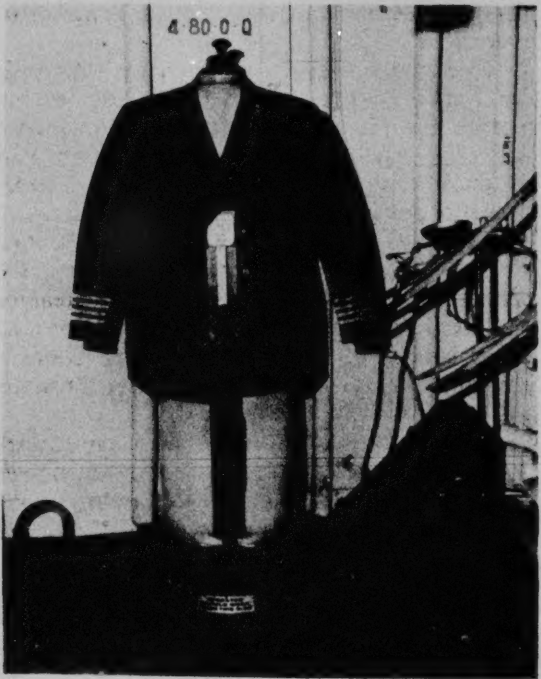

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Figure 9-14.—Pressing a sack coat on a steam-air-finisher.

A garment finished in the manner described above should remain hangered and removed from the steam chamber immediately after the appropriate cycles are completed. This avoids the setting of pressure wrinkles. Figure 9-15 illustrates one type of steam chamber that is presently being installed on board Navy ships.

STEAM-AIR FINISHER

Where available, the steam-air finisher may be used to finish such items as sack coats, overcoats, peacoats, reefers, and foul weather jackets. A representative model of the steam-air finisher that is presently being installed on board Navy ships is illustrated in figure 9-16.

OPERATION OF THE STEAM-AIR FINISHER

The steam-air finisher illustrated in figure 9-16 is operated by the movement of levers back and forth. The lever movements regulate the size of the nylon form at the waist, hip, and lower positions. Markings on the index plates enable the operator to re-set the levers on the exact adjustments for a known garment style size. Rotate the knob on the lever clockwise to lock, counterclockwise a quarter to half turn to unlock; move the knob forward to increase the size of the form, and reverse to decrease the size of the form. Excessive tightening or loosening of the knob will delay adjustments and production.

The waist control regulates expansion at the waistline, and is used to finish short jackets.

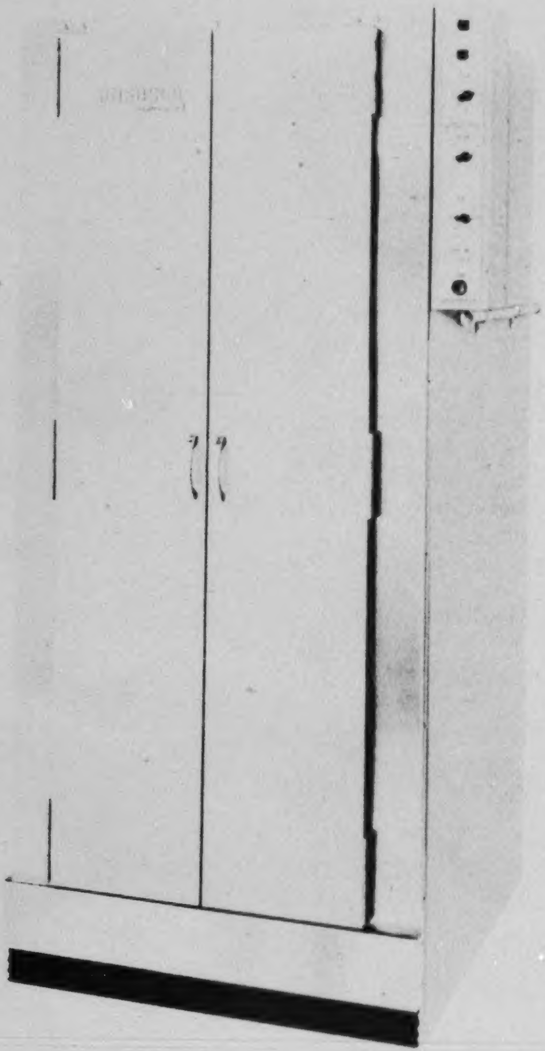

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Figure 9-15.–Steam chamber.

The hip control regulates expansion at the hip line, and is used to finish sack coats, medium length jackets, blouses, and other items.

The lower control regulates the expansion at the bottom for finishing topcoats, overcoats, raincoats, and other items.

The arm zippers are zipped open for sleeved garments; zipped closed for sleeveless garments. Adjustment between the opened and closed positions is necessary to provide the required amount of steam and air within the sleeve.

Clamps are provided for clamping the front edges and the rear vents of the garments. Front edges must overlap at least three inches with the buttons on the outside.

Check the form–it rotates 360 degrees to obtain the most convenient loading position. For the best results, the operator should step from the front to the rear, as required, because when the back clamp is in the open position, the clamp will strike the timer assembly when the form is rotated 360 degrees.

FINISHING WOOL COATS.–Place the coat on the finisher. Pull the two front edges of the coat forward. Overlap the edges at least three inches from the bottom of the coat to the lapels with the buttons on the outside. Close the front clamp. Close the buck clamp on garments having a rear vent.

Now the finisher is adjusted by setting the timer for continuous operation of air, and moving the air control to a minimum setting. Adjust the waist, hip, and lower controls as required. Insert the expanding sleeves into the sleeves of the garment.

The next step is to steam and dry the coat. Move the air control to obtain the required pressure. Set the timer for automatic steaming and drying. With the steam on, you may proceed immediately with touchup of the garment previously removed from the finisher. Steaming and drying is fully automatic.

Remove the coat when the steaming and drying cycle is completed. With the air off, remove the sleeves from the expanding sleeves. Release the front and rear clamps, and place the coat of a hanger or press the coat for touchup.

Refer to your manufacturer's instruction manual for information on how to finish other types of wearing apparel.

OVERCOATS, PEACOATS, AND REEFERS

Overcoats, peacoats, and reefers should not be pressed. To obtain best results with this type

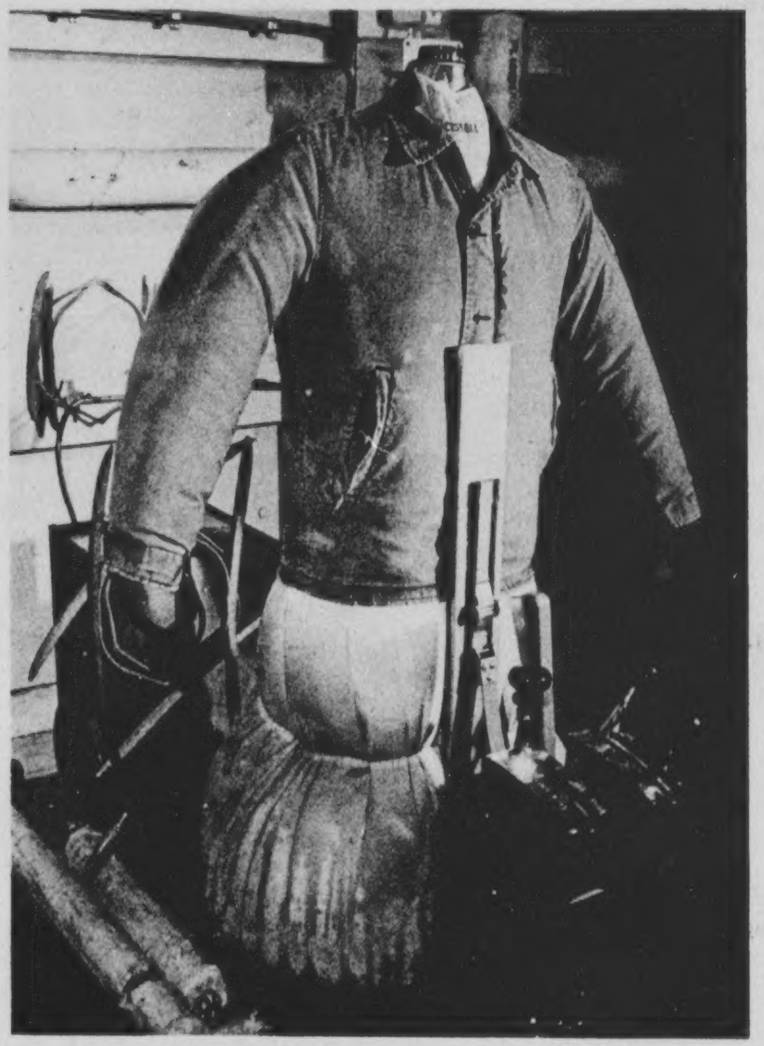

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Figure 9-16.—Pressing a foul weather jacket on a steam-air-finisher.

of material, it is only necessary to steam it. Lay the garment on the buck and apply steam, using a soft brush at the same time to bring up the nap. After the garment has been well steamed, apply vacuum to dry.

The lays for steaming these garments are the same as for pressing a sack coat.

Overcoats, peacoats, and reefers can be finished very efficiently in a steam chamber or on a steam-air finisher where they are available.

HAND IRON

While most of the pressing is done on the pressing machine, a hand iron is used for certain special jobs. The two principal uses of the hand iron are to OPEN (flatten) seams and to smooth out silk scarfs. When a seam is opened, the material must be dampened with a sponge before ironing. This helps prevent scorching, and also makes it possible to iron the seam out flat.

Silk has a tendency to wrinkle when steam is applied to it. Unless scarfs are handled very carefully on the pressing machine, they have to be finished with a hand iron. Two precautions must be taken when ironing silk. First, slightly dampen the material; second, be sure the iron is not too hot.

ASSEMBLING AND ISSUING

When you complete the pressing of clothes, get them ready for issuing. Use the drycleaning lists for assembling articles into customer groups. The number on the master tag(s) attached to the drycleaning list correspond(s) to the numbers of various articles in a customer's bundle. Put the tags in numerical order and collect all articles belonging to each master tag(s). Be sure that all articles written on the customer's drycleaning list are present or accounted for. Then check to see that all buttons are intact, and that belts and buckles are present. Missing buttons should be replaced, and all belts and buckles presented to the laundry should be returned with the cleaned article or replaced when lost. Keep a supply of raincoat buckles on hand.

After you collect and check all items which belong in a customer's bundle, attach the drycleaning list and put the items on the assembly and/or issue rack in numerical order. Most assembly racks are divided into sections: 0 to 9, 10 to 19, etc., or A to D, E to K, and so on.

As stated previously, the time for pickup by authorized persons is indicated on the drycleaning schedule. The hours are stated by divisions and activities, and staggered to prevent congestion in the pickup line. Delivery periods should be at stated periods which will not interfere with active drycleaning processes in the department. Experience in a drycleaning department soon indicates what issuing procedures are best for that particular plant.

CARE AND MAINTENANCE OF DRYCLEANING UNIT

Keep the surfaces of machines in the drycleaning unit free of dust. Wash them with hot water and soap, or a safe solvent. A light coat of wax applied to the surface of new machines helps to keep dirt from adhering to them.

Check for accumulations of lint on coils when you remove the lint bag in the evening. Once each week, open and inspect the cleanout at the top of the coil housing. Remove the cleanout above the damper housing to eliminate lint.

Check the cleanout back of the fan, and the fan wheel, for lint accumulations. Be on the alert for solvent and grease leaks. Occasionally, check the timer with a watch. See that maintenance and lubrication charts are followed, and report requirements for maintenance to your supervisor.

CHAPTER 10

REMOVAL OF SPOTS AND STAINS

Spots and stains that resist ordinary washing or drycleaning processes usually can be removed by special treatment suited to the substance and the fabric. This treatment is called SPOTTING, and the man who administers it is called a SPOTTER. Laundry and drycleaning personnel distinguish between spots and stains in the following fashion: a spot, such as might be caused by foods, blood, grease, or ink, is not a stain unless it has become "set" in the material. This "setting" usually results from the application of heat or from certain chemical reactions. Once set, the spot becomes a stain, which cannot be removed without some injury to the fabric. In many cases the injury is so minor that removal is still well worth while. In other instances, the risk of damage to the fabric is so serious that it is better to leave the stain in the fabric.

WHAT A SPOTTER SHOULD KNOW

Spotting requires considerable knowledge and skill. A spotter must identify the substance that caused the spot or stain, and he must know what cleaning agents and what types of treatment will remove it. Since the various fibers used in fabrics respond very differently to cleaning agents and methods of treatment, he must know how to determine what fibers compose a fabric. (See chapter 3.) In dealing with colored materials, he must also consider how an agent or treatment will affect the dye. Finally, he must understand the use of the equipment and tools of a spotter and be able to use them so as to get the best possible results.

Many of the fabrics the spotter handles will be expensive. Serious damage to any of them will mean financial loss as well as definite inconvenience for the owner. The spotter should therefore know before he attempts to remove a spot or stain that the substances and methods he intends to use will not destroy the fabric or ruin its appearance.

When in doubt as to whether a spot or stain can be removed without serious damage to the material, the spotter should contact the owner, discuss the problem, and get his advice. If the owner is not available, the supervisor should be informed and his advice obtained before starting the work. Damage to an expensive item will probably result in ill feeling and a laundry claim. Knowing when to stop work on a spot can be most important.

SPOTTING IN SHIPBOARD LAUNDRIES

Most ship's laundries are concerned only with spotting washable fabrics. In ships that have drycleaning facilities, stain removal for both washable and drycleanable garments should be handled by the drycleaning spotter.

As has already been indicated, early identification and treatment of some spots is necessary if they are to be prevented from becoming stains. Desirable as this may be, the workload of a ship's laundry does not permit examination of every item for possible spots. Certain precautions can and should be taken.

For instance, blood-stained and grossly soiled articles, if possible, should be hand washed before they are sent to the laundry. In the case of items from the sick bay, laundry personnel may be able to take care of the advance rinsing, but the sick bay laundry petty officer should cooperate by keeping the stained items separate from the rest of the laundry.

On ships with drycleaning sections, better spotting service can be given if a garment is tagged by the owner with a note identifying the cause of the spot. This information makes the spotter's work easier, faster, and more accurate. It also alerts him to do spotting before drycleaning.

Unless the above special precautions are taken, the spotter's work in a shipboard drycleaning plant will be done largely after drycleaning. Items that will be pressed should be examined for spots or stains before pressing to prevent the spot from being set by the heat of pressing.

If spotted articles frequently arrive for washing or drycleaning without being hand washed or tagged, it might be appropriate for the laundry supervisor to prepare a brief notice for all hands, tactfully pointing out the importance of this cooperation by the owner for successful removal of the stain. Such a notice could be forwarded, via the supply officer, for publication in the plan of the day.

For shipboard purposes, basic proprietary spotting chemical preparations should be used for the following basic stain groups: oil base type, protein type, tannin type, and miscellaneous (such as rust, metallic stains other than rust dyes, and writing ink).

For general laundry use, basic proprietary products requirements are for rust remover, paint-oil-grease remover, and liquid titanium stripper. In the drycleaning department, more sophisticated spotting tools and equipment are used for spot removal.

BASIC STAIN GROUPS

OIL BASE TYPE

Adhesive Tape
Airplane Dope
Asphalt
Carbon Paper
Crayon
Furniture Polish
Glue
Grass
Gravy
Grease
Hair Dressing
Ink, Ball Pen
Ink, Marking
Ink, Printing
Lacquer
Leather
Lipstick
Lotions
Mascara
Nail Polish
Oil
Ointments
Paint, Latex
Paint, Plastic
Pitch
Rouge
Rubber Cement
Sauces
Shellac
Shoe Polish
Soot
Soup
Tar
Varnish
Wax

PROTEIN TYPE

Albumin
Blood
Candy
Catsup
Chocolate
Cocoa
Discharge
Egg
Glue (animal)
Ice Cream
Jelly
Mayonnaise
Mercurochrome
Merthiolate
Milk
Perspiration
Salad Dressing
Starch
Sweets
Syrup
Vomit

TANNIN TYPE

Beer
Berry
Coffee
Fruit
Fruit Juice
Liquor
Perfume
Soft Drinks
Tea
Tobacco
Wine
Yellow

MISCELLANEOUS STAINS

RUST . . . .

METALLIC . . . .
(other than rust—)
silver nitrate, photo
developer, tarnish,
etc.

DYES . . . .

INK, WRITING . . . . .

SPOTTING TOOLS AND EQUIPMENT

Spotting tools and equipment consist of the following: (1) spotting board assembly—main spotting board, sleeveboard, garment tray, and spotting gun, (2) spotting brushes, (3) spatulas, (4) chamois, (5) towels, (6) cheesecloth, (7) blotters, (8) steam hose, (9) spotting bottles, (10) magnifying glass, and (11) drying cabinet (in some instances). The following discussion of spotting tools and equipment is not all-inclusive, but it is in sufficient detail to give you a general understanding of the operations. Figure 10-1 shows one type of spotting board currently used on Navy ships.

MAIN SPOTTING BOARD

The main spotting board is the spotter's work table. It is shaped like an ironing board to provide large and small work spaces for different sized articles. The board is usually a combination of smooth areas and a perforated or screened area at one end. The smooth surface is hard and usually made of glass, marble, or Monel metal, all of which are resistant to alkalies and acids. The smooth area is used for tamping and for applying spotting agents. The perforated or screened area is used for flushing. The perforated area must be taken apart and steam cleaned each day to remove excess chemicals and dyes.

Sleeveboard

The sleeveboard is mounted about six inches above the level of the main spotting board. The sleeveboard, like the main spotting board, also has a flushing and tamping area. The sleeveboard is attached to the main board by a movable arm, which can be adjusted. This board is used when working out stains on sleeves and other small areas. Clean the sleeveboard in the same manner as the main spotting board.

Garment Tray

The garment tray is under the main spotting board, midway between the board and the floor. The tray must always be clean; otherwise, the garment resting in it will be soiled.

Chemical Tray

The chemical tray is where all the basic spotting agents are placed.

Spotting Gun

The spotting gun is used for wool, silk, and synthetics for removing spots and stains. The gun is adjusted so that a slight pressure on the steam pedal provides steam; more pressure provides hot water or wet steam. If compressed air is piped to the spotting board, it too will come through the gun when the appropriate foot pedal is depressed. When vacuum is piped to the spotting board, it too is controlled by a foot pedal. However, the vacuum is piped to the perforated area of the board to dry and hold the garment in place while spotting. The spotting gun must be held about 4 inches above the garment. If the gun is held closer than 4 inches from the fabric, the steam or air pressure at 70 to 80 pounds per square inch can cause permanent damage to the fabric. At 70 to 80 pounds per square inch, the temperature of the steam coming out of the gun is over 300°F. The action of the spotting chemicals is greatly accelerated by an increase in temperature; this could cause permanent damage to the fabric and could result in color loss. At a 1/2-inch distance, the gun produces 212°F; at a 2-inch distance, the gun produces 165°F; and at a 4-inch distance, the gun produces 135°F. At a 4-inch distance, the chemical reaction will decrease the danger of bleeding the dyes. The spotting gun should be held perpendicular when blowing chemicals or spots through the fabric, and at a 45° angle when blowing chemicals or spots off a garment. Before using the spotting gun, aim the gun towards the deck and depress the steam pedal to remove excess condensation. The spotting gun must be cleaned daily and all chemicals removed from the nozzle.

SPOTTING BRUSHES

Spotting brushes help break up stains so that spotting agents can penetrate into and around the stains. When the spotting brush is not being used, the bristles should be pointed downward to allow the agents to drain from the bristles. The brush can also be placed in the brush holder to obtain similar results. When the brushes are used for tamping, the bristles should hit the fabric flat to prevent damaging the fabric. Never brush or scrub the spot.

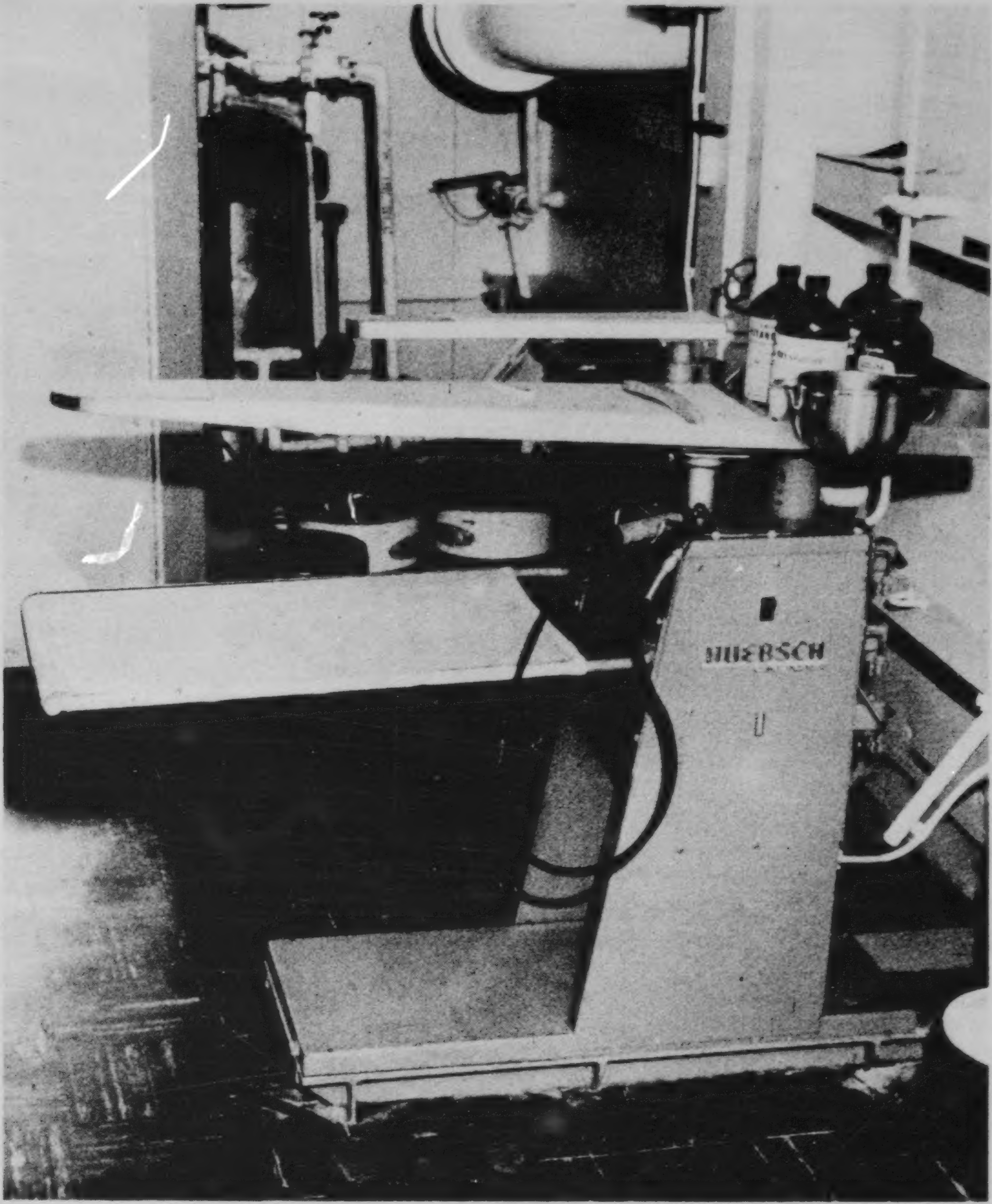

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Figure 10-1.–Spotting board.

Spotting brushes usually come in two sizes and two colors—3-inch and 2-inch, black and white—and are made of nylon bristles. The large brush is used mainly on woolens and synthetics because the bristles are spread far apart. The small brush has a close set of bristles and is effective on silks. The black bristle brush is used for dry-side spotting and for dark-colored fabrics. The white bristle brush is used for wet-side spotting and light-colored fabrics. After a brush is used on a garment, clean the brush with the spotting gun.

SPATULA

The spatula is made of stainless steel, bone, or ivory and is about one inch wide and five inches long. The spatula is usually pointed at one end and rounded at the other end; and is used to manipulate chemicals, soften the stain, and to get better penetration. The pointed end should not be used because it will dig into the fabric and distort it. The rounded end should be used for better results. After each use the spatula should be cleaned.

CHAMOIS AND TOWELS

A thick, heavy chamois is used for absorbing water and spotting solutions as they are removed from fabrics. The chamois should be spread smoothly over the portion of the spotting board being used at the time. A medium-weight turkish towel serves the same purpose. By absorbing cleaning chemicals, particularly acids, the absorbent prevents pitting of the spotting board. Keep chamois skins or turkish towels available for this purpose.

CHEESECLOTH AND BLOTTERS

Cheesecloth, being soft and absorbent, is used in spotting for feathering out—picking up all the moisture around a spot just removed. Unless you do this, rings will form. Chamois, because of its heavy texture, is not good for feathering out.

You can use blotters for absorbing materials rinsed from a garment. You can use them also to test the resistance of dyes in fabrics to cleaning chemicals and/or spotting agents. Put a small portion of fabric on a blotter and apply the chemical or spotting agent. The amount of coloring matter dissolved by the chemical and absorbed by the blotter indicates the effect of the chemical on the dye.

MAGNIFYING GLASS

When in doubt about the substance that caused a spot or stain, a spotter may examine it under a magnifying glass. Although an inexperienced spotter may get few results with a magnifying glass at first, he should continue using it. Through practice he will learn to identify various substances as they appear when magnified.

The magnifying glass is used to observe the weave and imperfections of the fabric and to identify the area of the garment as a spot or damaged fibers. It aids in determining the kind of spot or stain and in observing the action of the spotting chemical. The glass can be used to determine whether a spot has a staining substance or whether the spot has a chafed area with loss of dye. The glass can be used to determine whether the stained area is too weak to stand treatment or whether a spot on a synthetic fabric was caused by heat damage.

SOAP SOLUTION CONTAINERS

Usually each spotting board has two containers to hold soap solutions. The containers should be cleaned daily.

DRYING CABINET

Most ships' laundries will not have drying cabinets. If your ship has one, you will find it useful, especially when the workload is heavy. After spotting, the garment is hung in the drying cabinet. The drying cabinet should be large enough to handle the work, and tall enough for the longest garments. It should also be well-ventilated so as to speed up drying, and the temperature in it should be from 100° to 120°F.

SPOTTING BOTTLES AND AGENTS

Spotting bottles and agents are held in a tray at the right end of the spotting board. Dropper bottles with ground glass stoppers and rubber bulk pipettes are preferred. These types of bottles control the chemicals and conserve materials. However, on board ship, squeeze-type containers with a dropper top have been found to be more convenient and satisfactory from the standpoint of handling and breakage.

CHEMICALS

The chemicals commonly used to remove spots and stains are listed in table 10-1. Their characteristics and uses are given, and also the precautions you should take with them.

Table 10-1.—Chemicals Used in Spotting

Name	Characteristics	Uses	Precautions
Acetic acid, 28%	Clear, colorless liquid, pungent odor	To neutralize alkalis; to restore color; as general spotting agent	Bleeds basic dyes.
Acetone	Colorless, volatile liquid with agreeable odor; flammable	Solvent for stains from oils, resins, paints, varnishes, and nail polishes	Dissolves cellulose acetate and some basic dyes.
Ammonia	Colorless liquid of water and dissolved ammonia gas; evaporates	To neutralize acids; to restore color	Bleeds acid dyes and some direct dyes; at full strength, yellows white silk or wool.
Amyl acetate	Colorless liquid banana odor; flammable	Solvent for paint, lacquer, nail polish	Chemically pure is harmless; commercial or technical grade may damage cellulose acetate.
Amyl alcohol	Clear, colorless liquid; flammable	Solvent for formaldehyde resins	Harmless to all fabrics; bleeds some basic dyes.
Benzaldehyde . . .	Colorless, fragrant, volatile liquid	Removes black ink, hair dye, and some types of shoe polish	Affects cellulose acetate; bleeds some basic dyes.
Digestive agents	White or yellow powder	Convert albumins, starches, and sugars into simpler compounds which can be removed	Safe on all fabrics and dyes unaffected by water.

Table 10-1.—Chemicals Used in Spotting—Continued

Name	Characteristics	Uses	Precautions
Hydrochloric acid	Clear, colorless or slightly yellow, pungent liquid	Diluted, to remove dye and ink stains, and metallic soap stains	Concentrated, it injures all fabrics and bleeds basic dyes.
Hydrogen peroxide (3%) . .	Clear, colorless liquid	Spot bleaching; and small areas, on spotting board	Safe in dilute form.
Oxalic acid	Powder	Removes rust	Poison.
Potassium iodide	White crystalline or powdered substance	Removal of silver nitrate and other silver stains	Safe on all fabrics and dyes. Should be rinsed well.
Sodium chloride Common salt . . .	White, powdered or granular substance	Helps to remove blood and fruit stains	Safe on all fabrics if properly rinsed. Has setting action on direct dyes.
Sodium hypochlorite . . .	Clear, colorless,or slightly yellow liquid	Bleach for vegetable and synthetic fibers; to remove blood, blue stains, grass stains, indelible pencil, mildew and molds, medicine, and perspiration stains	Discolors animal fibers. Strong solutions will injure vegetable fibers. Follow treatment with a sour.
Sodium thiosulfate	Whitish, slightly opaque, crystalline substance	To remove iodine stains	Safe on all fabrics and dyes if rinsed well after using.
1,1,1-Trichloroethane (Methyl chloroform). . . .	Colorless, nonflammable liquid	General spotting agent for oil and grease stains	Safe on all fabrics. If warm, may bleed cellulose acetate dyes.

IDENTIFYING SPOTS AND STAINS

The ability to identify spots and stains comes with experience. A skilled spotter must be able to determine what the spot or stain is before attempting to remove it. Using the wrong chemical or technique may set the spot or stain. There are several guides for identifying spots and stains. With experience, nearly all spots or stains can be identified by using sight, feeling, odor, and location as a guide. Solvent and chemical tests are also very helpful.

SIGHT.—Sight is the most important and the quickest way to identify a spot or stain. Is the spot built up, built up and absorbed, or absorbed and visible on the back side? What is its shape? Is it dull or shiny, smooth- or rough-surfaced, or is it rugged with uneven edges? What is the color?

FEELING.–Is the spot hard, soft, sticky, or brittle? Does it become white when scratched?

ODOR.–Sometimes the odor is so prominent that positive identification of the spot or stain is possible without the use of other guides. Sometimes a drop of water or a feather of steam is required to intensify the odor. Is the odor sweet like perfume, sour, fishy, medicinal, or oily?

LOCATION.–Food spots are usually found on the front of the garment and on the underside of cuffs and sleeves. Perspiration stains are found under arms, across the back and shoulders, knees, and the seat of trousers. Leg makeup, mud, and shoe polish are found on the lower part of the skirt and coats, or legs and cuffs of trousers.

SOLVENT TESTS.–Solvent tests are used to determine whether the spot or stain should be removed by water or dry solvent. If the appearance indicates the spot or stain was spread by oil, solvent may remove the spot or stain. An ink spot may be tested as follows:

1. Add a drop of water to the ink spot. If the ink bleeds easily, the ink spot is considered to be water soluble.
2. Add a drop of ammonia to the spot. More color should bleed from the spot.
3. Add a drop of acetic acid to the spot. If no more color bleeds, then remove the ink spot by a water and ammonia process of bleeding and flushing until spot is completely removed.
4. If water does not bleed the ink spot, add dry solvent. If the ink bleeds, then the ink spot is ballpoint, marking, mimeograph, or printing ink, which must be removed on the dry side. Continue bleeding and flushing until spot is removed.

CHEMICAL TESTS.–Litmus paper indicates the presence of acid or alkali. Tannin can be discovered by applying a drop of ammonia to a spot or stain and noting whether the color turns tan or brown. The change to tan or brown indicates the presence of tannin. Wine and berry stains are distinguished from ink stains by a discharge of color. The color of wine and berry stains will change from blue to red and back to blue with alternate applications of ammonia and acid.

SPOTTING METHODS

Spots and stains are removed by one or more of four processes: (1) solution, (2) emulsification, (3) chemical action, and (4) mechanical action. These processes are basic to all washing and drycleaning, but they are applied in a more specialized way by the spotter.

SOLUTION

A solution is a mixture of two substances, the SOLVENT and the SOLUTE, in which the solute disperses uniformly throughout the solvent–or to say it another way, the solute dissolves in the solvent.

The most common way of removing soils and spots from fabrics is to dissolve them. Water is the solvent used in washing. In Navy drycleaning, as we have seen in chapter 9, the solvent chiefly used is perchlorethylene.

Water-Solvent Spots

Some substances, such as sugar, fruit juices, black coffee, blood, and albumin (e.g., eggwhite) will dissolve in water. In general, solubility is increased by a rise in the temperature of the water, which is why we use warm or hot water for washing. A few substances, however, are less soluble at high temperatures and will precipitate a stain on the fabric. Blood, as has already been said, is one of these. In washing white articles (chapter 4), the break suds is kept at a low temperature so as to remove as many as possible of the spots that might be set by higher temperatures. Sugar, black coffee, and many other substances dissolve more easily in hot water. Many water-solvent spots, then, can be expected to come out in the ordinary washing processes.

The drycleaning process will not remove certain water-solvent spots and these must be removed, either before or after drycleaning, by using water or steam. If the garment has been tagged by the owner to indicate the cause of the spot, removal can take place before cleaning. This practice has the advantage of helping to avoid a ring around the place where the spot was and is called pre-spotting. If not tagged, however, the spot will probably not be discovered and identified until the garment is examined between the cleaning and pressing operations. If the spot is clearly caused by blood or some other substance known to be set by heat, cool water should be used to remove it. Otherwise, the steam gun should probably be used.

Spots Requiring Other Solvents

Some substances will not dissolve either in water or in the regular drycleaning solvent but can be dissolved by spotting with other cleaning agents. In table 10-2 a number of the recommended materials are solvents. For example, see the treatment for removal of gum or resin and the recommendation for removal of paint from wool or silk.

Table 10-2.—Spot and Stain Removal Chart

GROUP NO. 1—Albuminous and Simple Food Stains.

Spot	Appearance	Removal Steps
(1) Food	Built up, dark, turns white when scratched	Step No. 1 (A) Dampen area with water or steam. (B) Apply neutral lubricant or protein type agent. (C) Tamp with brush, flush with water or steam. Step No. 2 (A) Dampen area with water or steam. (B) Apply ammonia (WHITE MATERIAL ONLY). (C) Tamp with brush, flush with water or steam. Step No. 3 (A) Dampen area with water or steam. (B) Apply wet spotter. (C) Tamp with brush, flush with water or steam. Step No. 4 (A) Dampen area with water or steam. (B) Apply digest powder. (C) Leave digester on stain for at least 15 min. (D) Flush with water or steam.
(2) Starches	Built up	
(3) Perspiration	Absorbed	
(4) Blood	Dull, absorbed, reddish brown	
(5) Mud	Dull, absorbed	
(6) Discharge	Absorbed, built up, dark or white	
(7) Glue	Built up	
(8) Ice Cream	Dull, absorbed	
(9) Sweets	Built up, dark to white	

Table 10-2.–Spot and Stain Removal Chart–Continued

GROUP NO. 2–Stains Containing Tannin.

Spot	Appearance	Removal Steps
(1) Coffee	Dull, absorbed	Step No. 1 (A) Dampen the area with water. (B) Apply neutral lubricant or tannin type agent. (C) Tamp with brush, flush with water or steam. Step No. 2 (A) Dampen area with water. (B) Apply neutral lubricant and 28% acetic acid. (C) Tamp with brush, flush with water or steam. Step No. 3 (A) Dampen the area with cold water. (B) Apply the general formula. (C) Tamp with brush, flush with cold water only. Step No. 4 (A) Dampen the area with water or steam. (B) Apply rust remover. (C) Never allow rust remover to come into contact with the spotting board. (D) Flush with water or steam. Step No. 5 (A) Dampen the area with water or steam. (B) Apply digest powder. (C) Allow digester to remain on stain for at least 15 min. (D) Flush with water or steam. Step No. 6 (A) Dampen the area with water or steam. (B) Spot bleach (Oxidizing). (C) Flush with water or steam.
(2) Tea	Absorbed	
(3) Liquor	Dull, Absorbed	
(4) Beer	Dull, absorbed, ring around the outside	
(5) Soft drinks	Absorbed	
(6) Fruit juices	Dull, absorbed	
(7) Medicine	Absorbed	
(8) Grass	Smeared, dull absorbed	

Table 10-2.—Spot and Stain Removal Chart—Continued

GROUP NO. 3–3 Miscellaneous Stains—Dye, Ink (Wet and Dry), and Rust.

Stain	Appearance	Removal Steps
(1) Ink (non-permanent) . .	Absorbed	Step No. 1 (A) Dampen area with water. (B) Apply rust remover or oil base type agent. (C) Flush area with water or steam. Step No. 2 (A) Dampen area with water. (B) Apply neutral lubricant and acetic acid or oil base type agent. (C) Absorb ink with a blotter. (D) Flush area with water or steam. Step No. 3 (A) Dampen area with cold water. (B) Apply general formula. (C) Tamp with brush. (D) Flush out with water or steam. Step No. 4 (A) Dampen area with water. (B) Apply neutral lubricant and ammonia. (C) Absorb with a blotter. (D) Flush area with water or steam. (E) Dry area completely. (F) Bleach (reducing).
(2) Ink (permanent)	Absorbed	
(3) Dye stains	Absorbed	
(4) Rust	Absorbed, reddish color	Step No. 1 (A) Flush area with water or steam. (B) Apply rust remover. (C) Flush area with water or steam.

Rinsing

When a substance has been dissolved, the solution must be rinsed out of the fabric. In washing and drycleaning, the rinsing steps take care of this. In spotting, it is usually done with the steam spotting gun. If you have no steam spotting gun, sponge the spot carefully.

EMULSIFICATION

In washing and sometimes in drycleaning, the solvent is assisted by a soap or detergent. These substances are emulsifiers. They are needed because certain substances, for instance, grease, will cling to the fabric instead of dispersing in the solvent. The emulsifier forms a layer around the particles of grease that is more easily soluble than the grease. This principle is used in spotting also.

CHEMICAL ACTION

In chemical action, two or more substances combine to produce one or more totally new substances. This is what happens when you use an acid to remove an alkaline spot or use an alkali, like ammonia or sodium bicarbonate, on an acid spot. When you apply ammonia to an acid stain, the two substances react chemically to form a soluble salt that can be rinsed out of the fabric. Bleaches remove color through chemical action.

Chemicals must always be used very carefully because of the danger that they will affect the dye or will damage the fibers. Note that in several instances in table 10-2 it is recommended that other methods be tried first and the chemicals resorted to only for persistent stains.

MECHANICAL ACTION

Mechanical action is both the simplest method of spot removal and an aid to all other methods. A simple dust spot can be removed by brushing, or gum sometimes may be lifted off so well with a spatula that almost no spot is left. When other methods are used for cleaning, some kind of mechanical action is always necessary. In washing or drycleaning, the washer is agitated; in spotting, you use a brush, a spatula, a sponge, or a spray gun to work the cleansing agent into the fabric. Rinsing also involves mechanical action.

The important thing to remember about all mechanical action is that it tends to wear or damage the fabric. Never use more force than is necessary and continue the action only as long as necessary. Consider how the various fibers react to mechanical action (for instance, felting of wool) and avoid actions that will injure them. The spatula particularly can cause damage to fabric when not used properly.

STAIN REMOVAL PROCEDURES

In figure 10-2 the spotter has a shirt pulled over the spotting board ready to begin work. Notice the spotting gun in the right hand of the spotter.

Now for some specific DO's and DON'Ts that the spotter (and you) should observe.

1. Stain removal should take place under the best possible light conditions and with adequate ventilation. Special care should be observed when using flammable substances to ensure the absence of flames or sparks. Methyl chloroform is nonflammable, but must not be used under conditions of poor ventilation because its vapors are toxic.

2. Examine the spot to determine, if possible, what substance caused it. Use the magnifying glass.

3. Unless you have reason to think the spot was caused by something that steam would set, use the spotting gun first. It is the simplest treatment and least likely to harm the fabric. Even if it doesn't remove all of the spot, it may take out some of it and make the rest of the job easier.

4. Before applying a cleaning agent consider how it will affect the fabric. If you are in doubt about the fibers in the fabric, it may be advisable to test them to determine what they are.

5. If in doubt about the effect of an agent on a fabric, make a test on some hidden portion. Don't take chances of ruining the article by guesswork.

6. Hypocholorite bleach should never be applied to any material containing silk, wool, mohair, or other animal fiber.

7. Concentrated and warm solutions of alkalies should never be applied to animal fibers.

8. Rayon articles should never be treated with organic solvents unless resistance to the treatment is assured by a preliminary test on an unexposed portion of the garment.

9. When using potassium permanganate solution, use an equal amount of magnesium sulfate with it. Caustic potash is one of the products formed when stains are treated with

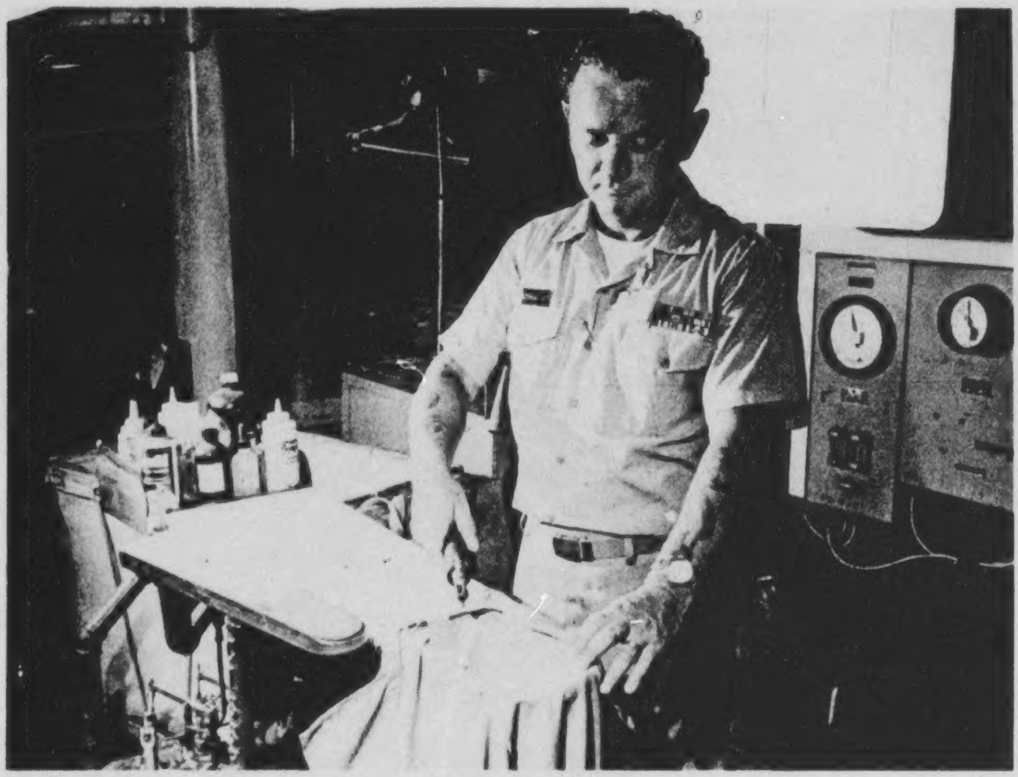

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Figure 10-2.—Removal of spots from a shirt.

permanganate. Magnesium sulfate reacts with caustic potash as soon as it is formed and prevents the textile from being injured.

10. Apply a small amount of the cleaning formula with a squeeze bottle or a spray gun, and allow it time to start to act on the spot.

11. Use a spatula to help the cleaning formula to penetrate the spot. Rub the spatula back and forth across the spot. Use short, smooth strokes. If a substance, such as gum, adheres to the surface, it may be gently removed with the spatula. Be careful not to apply too much pressure, particularly on the point, or you will damage the fabric. Use the side of the point as much as possible.

12. Follow the preceding step with the spotting brush. Variations in holding the brush depend upon the length of the bristles, the size and length of the handle, and the amount of pressure you wish to apply. It is best to have all the bristles strike the fabric at the same time, and use smooth, even pressure when working the brush back and forth. Too much pressure on the toe, heel, or sides of the brush may damage the fabric.

13. Always avoid excessive friction when treating silk and rayon fabrics. Where some friction becomes necessary, it is sometimes desirable to work on the wrong side of the garment.

14. Do NOT use a spatula on silk or synthetic material. The pressure you can apply on it without doing damage to the fabric is insufficient to do any good.

Table 10-3.—Spotting Formulas

Formula	Chemical Composition	When Used
General Formula	Amyl acetate . . . . . . 1 part	Used with water to remove ink, tannin, berry, lipstick, and dyestuff stains, or stains that contain dyestuff. Safe on all fabrics when cold, but not on all dyestuffs.
	Glacial acetic acid 99% . . . . ½ part	
	Lactic acid . . . . 1 part	
	Oxalic acid crystals (by weight) . . . . . . ½ part	
	Synthetic methanol . . . . 1 part	
Paint remover	Chloropicrin. . . . . . . (Use as prescribed by the manufacturer)	Good for removing all kinds of paint and similar substances. Evaporates completely.
Prespotting soap	Ammonia (26°). . . . . ½ part	Used on paint, oil, tar, road oil, and asphalt to prevent SETTING during the drycleaning process. Blood and tannin stains should be removed by water before you dryclean.
	Hexalin . . . . 2 parts	
	Oleic acid . . . . 3 parts	
	Water (distilled). . . . . 1½ parts (Can use plain water.)	
Wet spotters	Acetone . . . . 1 part	Wet and dry solvents are used to remove soil, paint oils, and greases. For very severe stains, or large areas, DO NOT USE wet spotters.
	Castile soap . . . . 6 parts	
	Chloroform . . . . 1 part	
	Ethyl acetate . . . . . . 1 part	
	Synthetic methanol . . . . 1 part	
	Water . . . . 1 part	

15. Remove spots and stains from delicate fabrics by placing the stained portion over a pad of clean cloth or a white blotter and applying the cleaning solution with a squeeze bottle. A medicine dropper or clean sponging pad may also be used.

16. Allow sufficient time for a cleaning solution to penetrate, but remove it as soon as possible to prevent damage. If removal agents are allowed to dry in fabrics or are pressed in them, they will probably discolor and/or damage the material. Therefore, be certain all cleaning agents are thoroughly rinsed from the materials as quickly as possible.

SPOTTING FORMULAS

The spotting formulas listed in table 10-3 are the ones generally used for removing spots and stains, for the purpose indicated. They are included in this chapter for your information, in case you do not have satisfactory commercial products. All ingredients of these formulas are generally available aboard ship.

CHAPTER 11

DECONTAMINATING AND DISINFECTING

In event of nuclear, biological, or chemical attack, clothing worn by monitoring and decontamination crews will probably become contaminated. In addition, clothing worn by other personnel and clothing in storage may be contaminated. The ship or station laundry can be used for decontaminating certain types of clothing, provided suitable precautions are observed.

This chapter covers general procedures for all types of decontamination in the laundry and specific directions for decontamination of each of the three types of agents. It also treats briefly the subject of disinfecting sick bay laundry. It covers ordinary garments such as work clothing and items of uniform and such special clothing as boots, rubber clothes, and wet weather and cold weather clothing. Leather items, such as shoes, cannot be effectively decontaminated in the laundry, and so are not discussed here. Present decontamination procedures are not considered to be completely effective against all agents, especially the newer nerve gases. Clothing should, therefore, always be tested for the presence of an agent.

It is assumed here that you are already familiar with the general training in defense against NBC agents which are covered in the Military Requirements courses. It may be advisable for you to review the appropriate chapters in these courses before studying this chapter, because the Military Requirements courses cover the basic principles of NBC defense, whereas here we are concerned with applying some of those principles to the laundry and its operation.

GENERAL DECONTAMINATION INSTRUCTIONS

Successful defense against any type of NBC attack requires advance planning and organization—predesignated teams that can go into action quickly because their members know what to do and how to do it. Provision must be made for quick identification of contamination so as to know what measures to take against it. Personnel must be protected as much as possible. Clean spaces must be protected from contamination. Special attention must be given to protection of such items of general use as the water system and supplies of food and clothing. Let us see how these basic necessities apply to decontamination in the laundry.

RESPONSIBILITIES IN DECONTAMINATION

In all types of decontamination, laundry personnel will be working with and to some extent under the direction of the damage control assistant or the medical officer.

Damage control personnel will be responsible for initial monitoring and for identifying the contamination. Probably the clothing to be decontaminated will be brought to the laundry by damage control personnel. The damage control officer will issue whatever protective clothing you may need and any monitoring equipment you may need to use during or following decontamination. Damage control personnel should be able to give you advice and aid in preventing the spread of contamination within your spaces.

The medical officer will be a source of advice especially in matters relating to biological contamination. You may also be called upon to cooperate with the medical department in case of a shipboard epidemic, whether caused by biological attack or not. Other emergencies may require special processing of sick bay laundry. In all these cases, the medical officer will be responsible for determining the type of microorganism to be destroyed and the measures required for its destruction.

The responsibilities of the laundry supervisor and his personnel in these cooperative efforts include the following:

1. Applying knowledge of fibers and fabrics in determining the effects of proposed decontamination measures. (There is no point, for example, in spending time processing a piece of clothing if the process chosen will destroy the article for further usefulness.)
2. Knowing what can be done in the laundry with existing equipment and supplies.
3. Keeping current on the best methods of decontamination and using the best methods feasible when called upon.

PROTECTIVE MEASURES

The laundry supervisor must apply, and see that his men apply, the general rules for self-protection and for preventing spread of the contamination.

Protection of Personnel

Care must be taken to prevent or minimize the contamination of personnel engaged in the cleansing of contaminated clothing. Suitable protective clothing, such as protective masks, rubber gloves, rubber boots, and protective aprons or coveralls, should be worn. Remember that shirt cuffs should extend inside the tops of the gloves and that trouser cuffs should be secured by cord or be tucked into the tops of boots or heavy socks. If protective masks are not available, a large clean handkerchief tied around the nose and mouth will help considerably. Check with the responsible damage control personnel about the possible need for other protective hand covering.

Avoid eating, drinking, or smoking while handling contaminated materials. In other words, do everyting you can to keep the contaminants from entering your body.

Protection of Clean Spaces

Limit as much as possible the laundry space devoted to decontamination procedures. Contaminated articles should come into the laundry in closed containers which limit the spread of the contaminating agents. The contaminated articles should be transferred as directly as possible to a washer. If it is necessary to store contaminated articles, keep them away from other laundry. Do not use more washers for decontamination than circumstances require.

ALWAYS WASH CONTAMINATED ARTICLES SEPARATELY FROM OTHER LAUNDRY.

Disposal of Wash Water

Water used during the decontamination of radiologically contaminated clothing will be contaminated, for the process does not neutralize or destroy the radioactivity but only physically removes the radioactive material. Biological or chemical agents also are likely to leave some contamination in the water, depending on the efficiency of the decontamination procedure. Precautions, therefore, should be taken to see that used water is not spilled on the deck. Since laundry drains carry the water almost directly out of the ship, contaminated water in the drainage system is not a serious problem. The drain will be cleaned by the same process that decontaminates the interior of the washer. In a laundry at an advanced base, waste water must be disposed of so as not to present a hazard. The main thing for the laundryman to remember is to cooperate with those in charge of the base drainage system.

WASHING PROCEDURES AND FORMULAS

To ensure adequate decontamination, follow closely the procedures outlined in this chapter, especially in regard to the types and quantities of supplies. Some allowance may be made for time of cycles and water temperatures, but water levels and supplies used should be as specified. This chapter gives the directions current as this book goes to press, but it is your responsibility to keep up with improvements that may be made in these directions through NAVSUP directives.

The procedures and formulas given here have been developed for use with most common sizes of washers used afloat and ashore. They may, however, be adapted for use by other types of equipment by applying the appropriate tables.

Supplies Used in Decontamination

Several of the supplies specified in the decontamination formulas which appear as figures in this chapter are at present not carried in the supply system. In these instances, representative commercial trade names are listed.

All supplies, with the exception of detergents and sours, should be dissolved in water and diluted before introduction into the washer. All liquid supplies should be added while the cylinder is moving down.

Extracting and Drying

After laundering, garments should be extracted and dried following standard laundry procedures, with the exception of the drying cycle for impregnated clothing.

RADIOLOGICALLY CONTAMINATED CLOTHING

The radioactive materials on contaminated clothing may have been deposited in the form of dry particles, slurry, or in liquid solution, and therefore may be loosely deposited on the clothing, embedded in the cloth fibers, or entrapped in grease or soil adhering to the garments.

METHODS OF RADIOLOGICAL DECONTAMINATION

The methods of decontamination of clothing are brushing or vacuuming, washing, and aging. In some cases, brushing or vacuuming may reduce dry contamination to the permissible level. Washing, in most cases, will be adequate even if brushing has not been effective. Aging will in time reduce the contamination to a negligible level, depending upon the decay rate and amount of radioactive contamination. Aging, however, is time-consuming, requires suitable storage space, and presents a potential personnel hazard. Brushing and aging are briefly treated here, but washing procedures are your main concern.

A trained radiological monitor should be present for monitoring of personnel, clothing, areas, and for establishing safety precautions. The clothing should be monitored and segregated according to radiation levels.

BRUSHING

Ordinary brushing, shaking, or vacuuming will in many cases remove a considerable amount of loose contamination from clothing. If you do this work, do it in the open air—not in the laundry or anywhere else below decks unless a space has been designated for this purpose.

The following safety precautions should be observed with brushing:

1. Wear protective mask and suitable clothing.

2. Brush (or shake) from the windward side of the contaminated item.

3. Take care that transfer of contamination to clean areas or to other personnel does not occur.

4. Have your work and yourself checked by monitor.

5. Decontaminate yourself immediately after work if there is any possibility that you are contaminated.

Aging

Clothing which is to be decontaminated by aging should be stored in designated areas where it will not constitute a hazard, and marked to indicate that it is radioactively contaminated. The length of time it must be stored will depend on the type of contamination and the radiation levels. The progress of the aging process should be determined by periodic monitoring.

REMOVING RADIOACTIVE MATTER BY WASHING

Clothing should be monitored before being brought into the laundry. If above a certain level of radioactivity it will have to be thrown away. If salvageable, it should be subdivided according to whether it is above or below a tolerance level which will be established by the damage control officer. Finally, it should be classified according to standard laundry procedures. In dealing with radioactive contaminated linen, it is very important to avoid any type of residue such as lime soap, since such materials "lock up" radioactive substances.

Laundering procedures discussed below should be used, depending upon the level of radioactivity.

Clothing Below Tolerance Level

Clothing contaminated below the tolerance level should be laundered to remove loose contamination that might otherwise be a hazard if swallowed or inhaled. Laundering formula A or B may be used or any good multiple suds formula employing synthetic detergent. The water levels and the number of gallons of free water corresponding to that level for washer-extractors are given in table 11-1. The dry loading of clothing should be in accordance with table 11-1. The total amounts of supplies required are given in tables 11-2 and 11-3. It should be noted that the quantities to be used are dependent on the size of the washer and the number of gallons of water in the washer.

Clothing Above Tolerance Level

Clothing contaminated above the tolerance level should be laundered using formula C. The

FORMULA A

Laundering of Cotton Clothing Contaminated Below the Tolerance Level With Radioactive Contamination

Operation	Water Level (Table 11-1)	Time Minutes	Temperature °F	Supplies (see Table 11-2)
Suds	L1	5	100	Synthetic detergent (0.18 oz./gal.)
Suds	L1	10	130	Synthetic detergent (0.09 oz./gal.)
Suds	L1	10	140	Synthetic detergent (0.06 oz./gal.)
Rinse	L3	5	140	None
Rinse	L3	5	120	None
Rinse	L3	5	100	Sour (0.046 oz./gal.)

FORMULA B

Laundering of Woolen, Synthetic, and Blended Clothing Contaminated Below the Tolerance Level With Radioactive Contamination

Operation	Water Level (Table 11-1)	Time Minutes	Temperature °F	Supplies (see Table 11-3)
Suds	L3	5	100	Synthetic detergent (0.13 oz./gal.)
Suds	L3	5	100	Synthetic detergent (0.07 oz./gal.)
Rinse	L4	3	100	None
Rinse	L4	3	100	None
Rinse	L4	3	100	None

water levels to be used are given in table 11-1. The supplies required are given in table 11-4. The successful removal of radioactive materials from contaminated clothing requires the use of chelating agents, which are chemical compounds with the ability to hold metallic ions in suspension and prevent them from being redeposited on the clothing. A recommended organic chelating agent is the tetrasodium salt of ethylene diamine tetracetic acid (Versene, powder or beads). Inorganic phosphates which may be used as the chelating agent include sodium hexametaphosphate (Calgon) and sodium tetraphosphate (Quadrafos). The

TABLE 11-1

Loading Capacities–Washer/Extractors

Approximate Gallons of Free Water in Shell vs. Running Water Level–Inches Above Cylinder

Load in lbs.	L1 5″	L2 6″	L3 10″	L4 12″	L4 14″
25	11	13	22	26	–
60	20	23	34	40	–
100	27	27	54	–	63
135	18	22	38	46	–
200	26	30	46	–	62
350	42	48	72	–	97

TABLE 11-2

Supplies for Formula A

	Synthetic Detergent Oz.			
Load (lbs.)	1st Suds	2nd Suds	3rd Suds	Sour (oz.)
25	2	1	¾	1 oz.
60	4	2	1-¼ oz.	1.5 oz.
100	5	2.5	1.5	2.5 oz.
135	3.5	1.75	1	1.75
200	4.75	2.75	1.5	2.75
350	7.5	3.75	2.5	3.5

quantities specified in table 11-4 should be increased by the amount required to soften the volume of water in the washer. The additional quantities for this purpose, listed below, are required only if shore water rather than ship's evaporated water is used:

Versene, 1 ounce per 83 grains of total water hardness;

Calgon, 1 ounce per 31 grains of total water hardness;

Quadrafos, 1 ounce per 24 grains of total water hardness.

TABLE 11-3

Supplies for Formula B

	Synthetic Detergent Oz.	
Load (lbs.)	1st Suds	2nd Suds
25	3	1.5
60	4.5	2.5
100	7	4
135	5	2.5
200	6	3
350	9.5	5

(Remember that the oil and water king of your ship can tell you how hard the water is.)

An example of the method used to determine the total amount required to be added for softening of the water in the washer is as follows:

A 12-inch water level in a 25-pound washer-extractor will contain 26 gallons of water. If the water being used has a hardness of 10 grains per gallon, the total hardness of the 26 gallons is 260 grains.

$$260 \div 83 = 3.13$$

Therefore, approximately 3 ounces of Versene should be used to overcome the hardness of the water. This would be in addition to the specified quantity of chelating agent indicated in the first and second rinses of the "chelate" column of table 11-4.

Monitoring and Rewashing

After extracting and drying, the clothing should be monitored, using standard survey instruments. If the contamination is not reduced sufficiently after three launderings, the clothing should be disposed of or stored for aging.

FORMULA C

Laundering of Clothing Contaminated Above the Tolerance With Radiological Contamination

Operation	Water Level (Table 11-1)	Time Minutes	Temperature °F	Supplies (see Table 11-4)
Suds	L3	5	90-100	Synthetic detergent (0.17 oz./gal.)
Acid	L4	5	140	Citric Acid (1.14 oz./gal.)
Acid	L4	4	140	Citric Acid (0.57 oz./gal.)
Chelate . . .	L3	5	140	Chelating Agent* (.37 oz./gal.)
Chelate . . .	L3	5	140	Chelating Agent* (.18 oz./gal.)
Rinse	L4	3	140	None
Rinse	L4	3	140	None
Sour	L4	5	Tap	Laundry Sour (.027 oz./gal.)

Note: For woolens, temperatures not to exceed 100°F and the washer should be stopped during draining and refilling.

*In addition to amount required to soften water.

TABLE 11-4

Supplies for Formula C

Load (lbs.)	Suds Syn. Detergent (Oz.)	Acid (Oz.)		Chelate (Oz.)		Sour (Oz.)
		1st	2nd	1st	2nd	
25	4	30	15	8	4	1
60	6	46	23	13	6	1
100	9	72	36	20	10	2
135	7	53	26	14	7	1
200	8	71	35	17	8	2
350	12	111	55	27	13	3

TABLE 11-5

Supplies for Formula D

Load (lbs.)	1st Suds Detergent (Oz)	+ STB (Oz)	or HTH (Oz)	2nd Suds Detergent (Oz)
25	3	24	10	2
60	5	37	16	2.5
100	7	59	25	4
135	5	42	18	3
200	6	51	22	3
350	9	79	34	5

Washing Special Items

Impermeable or rubberized items such as gloves, boots, and rainwear may be decontaminated by hosing and scrubbing with a detergent solution.

CHEMICALLY CONTAMINATED CLOTHING

Clothing may be contaminated with chemical agents in the form of splashes, droplets, or absorbed vapor. Items contaminated with large visible splashes should be segregated and treated separately. After being decontaminated, the clothing should be tested for presence of agents, using a detector kit.

METHODS OF CHEMICAL DECONTAMINATION

Clothing may be decontaminated using one of the following methods, in accordance with the order of preference indicated:

1. Expose to air for as long a period as practicable, followed by laundering using formula D or E. Formula D should be used for woolen, synthetic, and blended items and for Clothing, Chemical Warfare Protective, CC-2 Impregnated. Formula E should be used for cotton clothing. The appropriate water levels are given in table 11-1. The supplies required are given in tables 11-5 and 11-6. It will be noted that two chlorine compounds are listed: Super Tropical Bleach (STB), and high test calcium hypochlorite (HTH), which is the standard laundry item. Either one may be used; however, care must be taken to ensure that the correct amounts are employed. The load of dry clothing according to washer size may be found in table 11-1. If clothing is still contaminated after laundering, the process should be repeated. If contaminated after the second laundering, the clothing should be discarded. The chlorine compounds (STB or HTH) used in the laundering procedure will bleach colored garments and may have a tendency to damage woolen materials.

2. Boil in water for 30 minutes.

3. Expose the clothing to hot air circulation in the tumbler-dryer.

Method 3 should be considered only for clothing contaminated with absorbed vapors or the more volatile agents. This procedure is considered to be the least desirable and is not recommended for use by forces afloat as it will, in effect, expose nearby personnel, and perhaps much of the ship, to gas contamination. If used by shore

FORMULA D

Laundering of Woolen and Impregnated Clothing
Contaminated With BW or CW Agents

Operation	Water Level (Table I)	Time Minutes	Temperature °F		Supplies (see Table 11-5)
			Woolens	Impreg. Clothing	
Suds	L3	5	100	90	Detergent (0.13 oz./gal.) STB (1.1 oz./gal.) or HTH (.47 oz./gal.)
Suds	L3	5	100	90	Detergent (0.07 oz./gal.)
Rinse	L4	3	100	90	None
Rinse	L4	3	100	90	None
Rinse	L4	3	100	90	None

Note: The dryer temperatures for impregnated clothing should not exceed 155°F.

stations, adequate precautions should be taken to prevent the exposure of personnel to the toxic exhaust fumes from the dryer.

Processing Special Items

Impermeable or rubberized items such as boots, gloves, and rainwear may be decontaminated by immersion in a solution of 1 1/2 ounces of calcium hypochlorite (HTH) per gallon of water for a period of 2 to 4 hours, depending on instructions from damage control personnel.

BIOLOGICALLY CONTAMINATED CLOTHING

Biologically contaminated clothing is that which has been exposed to bacteriological agents in the form of bacteria, viruses, or similar agents. In many instances the same methods may be used for biological decontamination as for chemical decontamination.

METHODS OF BIOLOGICAL DECONTAMINATION

The following procedures may be used for the decontamination of biologically contaminated clothing:

1. First, laundering using formulas D or E. The procedure to be followed is the same as for chemical decontamination.
2. Second, autoclaving at 253°F for 15 minutes. This method is a surgical sterilizing procedure and is suitable only for cottons.

In addition to the above, various disinfectants may be used, such as ethylene oxide and methyl bromide. Care should be taken with these materials, however, as most of them are toxic or explosive.

FORMULA E

Laundering of Unimpregnated Cotton Clothing Contaminated With BW or CW Agents

Operation	Water Level (Table I)	Time Minutes	Temperature °F	Supplies (see Table 11-6)
Suds.	L2	5	100	Detergent (0.18 oz./gal.) STB (1.1 oz./gal.) or HTH (.47 oz./gal.)
Suds.	L2	10	130	Detergent (0.09 oz./gal.)
Suds.	L2	10	140	Detergent (0.06 oz./gal.)
Rinse	L3	5	140	None
Rinse	L3	5	120	None
Rinse	L4	5	100	Sour (0.046 oz./gal.)

TABLE 11-6

Supplies for Formula E

Load (lbs.)	1st Suds			2nd Suds Detergent (Oz)	3rd Suds Detergent (Oz)	Sour (Oz)
	Detergent (Oz)	+ STB (Oz)	or HTH (Oz)			
25	2.5	14	6	1	1	1.25
60	4	25	11	2	1.5	2
100	5	30	13	2.5	1.5	3
135	4	24	10	2	1.5	2
200	5.5	33	14	3	2	3
350	9	53	23	4.5	3	4.5

Impermeable items, such as rubber boots, gloves, or aprons may be decontaminated by boiling in water for 15 minutes.

PROCESSING SICK BAY LINENS

In event of an epidemic or other special situation requiring the laundry to disinfect quantities of sick bay linens, the medical officer will furnish information about effective measures for disinfecting or sterilizing.

Disinfecting and Sterilizing

At this point you should distinguish between the terms DISINFECT and STERILIZE.

DISINFECT means to reduce contamination from biological agents below the level of danger for ordinary use (whether contamination is the result of enemy action or of contact with a sick person or a carrier of germs).

STERILIZE means to kill all living organisms on the material. Sterilization is necessary for materials to be used in surgery. Once articles have been sterilized, they must be carefully protected from handling or even exposure to air, so that they will not be recontaminated.

Using the Washer to Disinfect

Usually you will not be confronted with the problem of achieving and maintaining absolute sterility in articles washed. You may, however, be asked to assist the medical department in disinfecting sick bay linens that require strenuous measures to kill the germs contaminating them. Sometimes special equipment is available for this purpose, but if not, disinfecting can be accomplished in the washer by using very high temperatures or by adding quarternary ammonium to the last rinse. The proportion of the compound to be added is 3 or 4 ounces per 100 pounds of clothes. Since wool blankets cannot be washed at a higher water temperature than that recommended in formula D without serious damage, it is best to use ammonium compound for washing them if more than ordinary disinfecting is required.

To use the washer for disinfecting by high temperature, add steam to the usual amount of rinse water. Bring the temperature up to 180°F or whatever temperature the medical officer recommends.

CAUTION: After using the washer for disinfecting at a high temperature, have it lubricated. The high temperature melts the grease at the bearings and causes it to run out.

Protection Against Recontamination

In all disinfecting, great care must be taken to protect materials from becoming recontaminated. Sick bay linens, including bed linens, towels, bed gowns, and uniforms of sick bay personnel, should all be given special protection to keep them clean. They should be handled as little as possible and then only by persons who are thoroughly clean and healthy. Don't let anyone with a cold, a boil, or any other infectious condition handle sick bay linens.

Put clean linens into clean laundry bags or baskets or wrap them in clean paper. Never put them into the unsanitary containers they came out of.

Take precautions to see that they are not dropped on the deck or otherwise contaminated through careless handling.

CLEANUP AFTER DECONTAMINATION

In the process of decontamination, laundry spaces, equipment, and personnel will probably become contaminated to some extent. Once the operation is finished, cleanup should be as prompt as possible and as thorough as necessary.

WASHING MACHINES

To remove contaminants from the interior of a washing machine, run it through a complete cycle with very hot water and a heavy suds of detergent. The outside of the machine should be cleaned by the methods used for the laundry space and other equipment.

MOVABLE EQUIPMENT

Movable items, such as laundry baskets, should be scrubbed with a suds of detergent (or whatever cleaning agent is recommended by damage control personnel). After decontamination, the articles should be placed in clean spaces.

LAUNDRY SPACES

Conventional cleaning methods, such as scrubbing, wiping, and rinsing will probably be sufficient for decontaminating laundry spaces. Clean the uppermost surfaces first and work down. Rinse swabs frequently in clean water. Monitor the swabs at intervals and dispose of them when the contamination reaches a level near that of the surface being cleaned. Clean access openings in ventilation ducts by running swabs through them.

PERSONNEL

Immediately after completing a decontamination, personnel should undress, bathe, shampoo their hair, and dress in clean clothing. The clothing worn during decontamination should be monitored to see whether it needs decontaminating and should, in any event, be washed before wearing again.

CHAPTER 12

PORTABLE LAUNDRY EQUIPMENT

The Navy requires portable laundry facilities for its advanced bases. Some advanced bases which do not have portable laundries procure usable machinery and set it up in a building adjacent to the mess hall, so that hot water and steam from that source can be used to operate it.

This chapter discusses the equipment in a portable laundry and how to operate and care for it. It also covers laundry organization on advanced bases, and the duties of personnel in such a laundry.

PORTABLE LAUNDRY UNIT

A typical portable laundry unit is illustrated in figure 12-1. Each section of the unit is marked. The washer-extractor of the unit shown is 40"x 30" and has a three pocket (Y-type) cylinder made of corrosion-resistant metal. The tumbler-dryer of the model shown is 30" long and has a 37" cylinder. The type of steam generator generally used has a capacity of 690 pounds of steam per hour. A larger size generator gives 1000 pounds of steam per hour. The generator burns 80 octane gasoline or No. 2 fuel oil. It will probably be necessary to make adjustments to the generator if you change from one fuel to the other.

The complete portable laundry unit occupies a space 4'x 20'. Additional space, of course, is required for storage of fuel and all types of supplies, for receiving and stowing, and for working. The laundry can be set up in a building or in an open field with adequate protection from the weather.

Figure 12-2 shows the rear view of the laundry.

Facilities required for the portable laundry include:

- Clean water–3500 gallons for the washer and 200 gallons for the steam generator during eight hours of normal operation.

- Electrical current–208 volts, 60-cycle, three-phase.

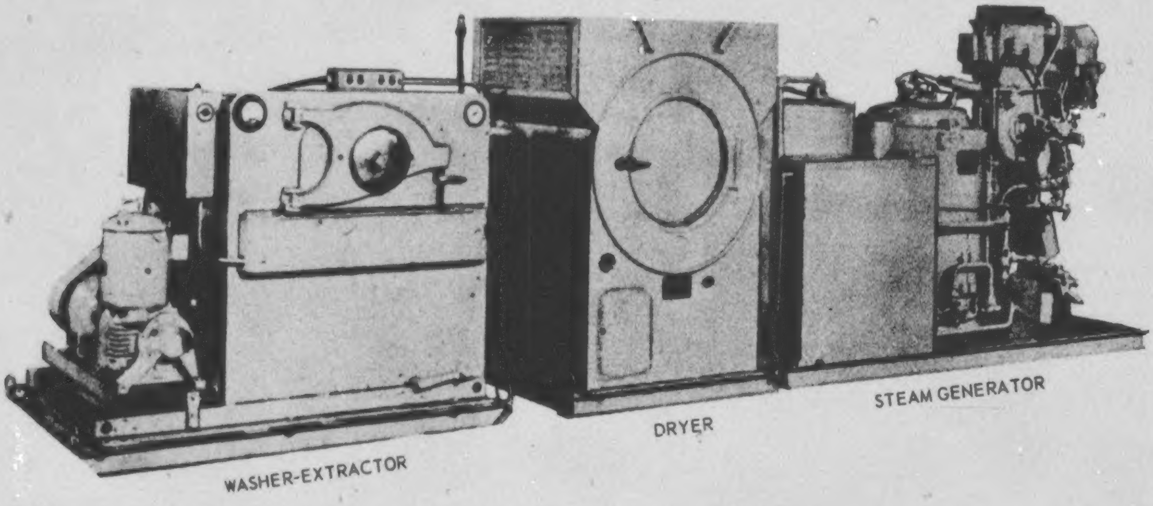
- Concrete foundation for washer-extractor. This machine creates strong vibration and requires a firm footing.

- Fuel–No. 2 fuel oil or 80 octane gasoline for steam generator.

- Adequate waste disposal. The best plan is to have a concrete floor in the laundry room, with a drain pipe under it. The floor can be constructed at the same time that the foundation for the machines is poured and will make cleaning much easier. The drain pipe can be connected with the base drainage system.

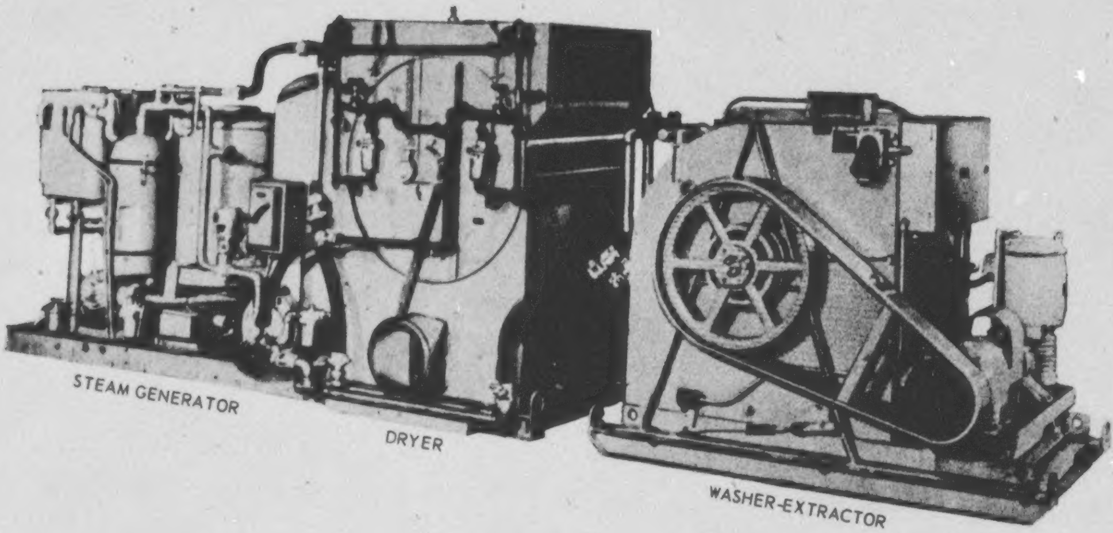
PORTABLE LAUNDRY ORGANIZATION

Just as aboard ship, the supply officer is responsible for operating the laundry. In some locations he may have an assistant supply officer to operate it for him. There are four jobs in the laundry to be performed by Ship's Servicemen and strikers. They are: (1) supervisor, (2) presorter, (3) machine operator, and (4) final sorter and assembler. The duties of these people are generally the same in all advanced base laundries. Each job is discussed briefly.


WASHER-EXTRACTOR
DRYER
STEAM GENERATOR

22.60X

Figure 12-1.—Advanced base portable laundry unit (front view).


STEAM GENERATOR
DRYER
WASHER-EXTRACTOR

22.61X

Figure 12-2.—Advanced base portable laundry unit (rear view).

LAUNDRY SUPERVISOR

As in a ship's laundry, the supervisor of a portable laundry is responsible for its operation. As a laundry manager, he is responsible for:

- Procurement of supplies and other essentials.
- Preparation of laundry schedule.
- Training of laundry personnel.
- Maintenance of laundry records.
- Operation of steam generator. (This is entirely the responsibility of the laundry supervisor.)
- Maintenance of laundry machinery. (He should know what minor maintenance he should perform and, from his study of the manufacturer's manual, when to request maintenance from the engineering department.)

Standards and procedures for operating an advanced base laundry will obviously vary in different situations. Plan your schedule to adapt the personnel and facilities available in the best possible manner to the laundry needs of the base. Use your judgment and follow the instructions of your superior. When suitable, use procedures recommended for shipboard operation, particularly when your laundry has other equipment, such as a steam press. This applies also to the instructions for handling permanent press items as discussed in chapters 4 and 5.

DUTIES OF A PRESORTER

A presorter in a portable laundry works under the supervisor and generally does the following:

- Removes bales or boxes of clothing from the soiled clothing storage area to the classification and identification area.
- Opens the bales or boxes and properly identifies each garment or lot.
- Classifies clothes by lots for washing.
- Weighs clothes for washing (normally 20 lbs. per unit to fit pockets in the washer).
- Puts unit weight on, or in, each unit of clothing and delivers it to the washer-extractor area.
- Maintains a record sheet for each bale or box of clothing, to show the quantity of each type of garment and the identification number.
- Signs the record sheet and delivers it to the supervisor, along with the identification numbers.

DUTIES OF A MACHINE OPERATOR

A machine operator works for the laundry supervisor and does such work as is assigned him. His primary duties include:

- Keeping the machines clean.
- Performing such minor maintenance as is necessary.
- Seeing that machines are kept in excellent repair.
- Informing his supervisor of maintenance requirements on machines.
- Selecting the washing formula, soap or detergent, and builder, suitable for a particular classification.
- Operating washer-extractor.
- Operating drying tumbler.
- Keeping area around machines clean.

DUTIES OF A FINAL SORTER

A final sorter is responsible to the laundry supervisor for:

- Taking clothes (in tote boxes) from the drier area to the assembly area.

- Assembling finished work under proper identification number, or ownership.

- Checking amount of clothing received from dryer with the record sheet, also noting any torn, damaged, or mutilated article and the cause for such condition.

- Signing the record sheet.

- Placing garments in containers for issuing, or wrapping them in bundles.

- Delivering processed containers or bundles of clothes to the processed storage area, with record sheet, and receiving tallies.

OPERATING THE WASHER-EXTRACTOR

The procedures for operating the washer-extractor in a portable laundry unit are similar to those for the washer-extractor discussed in chapter 4. There are some differences, however, in the operation of the two machines. The washer in the portable unit has three pockets in the cylinder, with a capacity of 20 pounds for each pocket. In operating the machine, you should follow the recommendations of the manufacturer for loads in each pocket. The weight in each pocket should be the same, so that the cylinder will run smoothly and without strain on the bearings. For such items as hand towels, the manufacturer states that the amount of the load in each pocket may be increased; but the bulk of articles in each pocket should not be so great as to prevent sufficient agitation of the clothes in the suds water. Study the manufacturer's instruction manual for further operating instructions.

WASHING FORMULAS AND DETERGENTS

Washing formulas discussed in chapter 4 of this text may be used in the portable laundry shown in figure 12-1. As you know, your wash water determines the washing ingredients you must use to get a proper suds for the load to be washed; that is, cotton, woolens, and so on.

Refer to chapter 4 of this text for the general procedure for operating the washer-extractor.

UNLOADING WASHER-EXTRACTOR

A mechanical door interlock in the washer-extractor prevents opening of the door while the cylinder is running. When the cylinder stops running, open the outer shell door by pressing the lock handle down. Use the INCH buttons to get each compartment door open, in turn, for unloading. When a door is in position, step on the brake pedal and then release the inch buttons. Release the latches on the compartment doors and unload the clothes into tote boxes or containers.

OPERATING THE TUMBLER-DRYER

The recommended procedure for operating the tumbler-dryer follows:

1. Slowly open the steam valves between the steam generator and the dryer coils.
2. Allow 10 minutes for the dryer to warm up with cylinder empty.
3. Load the cylinder to the rated capacity. DO NOT overload.
4. Close and secure the tumbler door.
5. Pull the starting knob on front of machine OUT. The high speed fan and cylinder now start rotating at the proper speeds. Moisture and lint are discharged through an opening in the rear of the tumbler. A vent pipe can be used to carry the discharge away from the washing area.
6. Check the thermometer on front of dryer. When it reaches 185°F, the clothes should be fully dried.
7. Tumble all dryer loads for 10 minutes with dampers set to deliver air at room temperatures before removal of clothing.
8. Stop the dryer.
9. Open the tumbler door and remove clothes from cylinder.
10. Refer to instructions for handling permanent press items discussed in chapter 5.

SAFETY PRECAUTIONS

Safety devices are built into the machines in the portable laundry unit. These protect both the operator and the machines. Safety interlocks prevent opening of the washer-extractor and tumbler doors when the cylinders are rotating. Thermometers show water temperatures. Brake pedals cut off current when depressed.

In operating the portable laundry, do the following:

- Study the manufacturer's instruction book, and then follow it.

- Keep the area around all machines clean.

- Watch temperature and pressure gages on steam generator. If they do not keep within the safety ranges indicated, cut off the fuel supply and have them checked by engineering personnel.

- DO NOT take chances with the gasoline. Keep it in an air-tight metal drum in an enclosure or in the shade. High temperatures cause expansion and evaporation. When drawing gasoline out and when filling the burner tank, be careful not to spill the gasoline, especially not on hot pipes. Your burner may have a fuel line which connects with a metal fuel drum. Do NOT smoke when handling fuel.

- Teach and emphasize safety in the entire laundry operation.

CARE AND MAINTENANCE OF EQUIPMENT

What has been said previously in this text about the maintenance of laundry equipment applies to units in the portable laundry. It is important that all laundry personnel understand the machines and how they operate, so that they can perform minor maintenance and know when to ask for qualified help for matters requiring more mechanical knowledge. Study the manufacturer's instruction manual for each machine, and be certain you really understand it.

Aboard ship you have no responsibility for the generation of steam for the laundry. When operating a portable laundry, however, one of your duties is CARE and MAINTENANCE of the steam generator. It is not a complex machine, but it can be a dangerous one unless you understand how to operate it. When engineering personnel are available, request that they perform all major maintenance and repair work.

APPENDIX I

COMMONLY USED FEDERAL SUPPLY LAUNDRY PRODUCTS

	Material	Specification	National Stock Number
I.	#*DETERGENTS	P-D-245C	7930-00-990-7391 25-lb BX
	Type I—for washing cotton whites and white synthetic-blend fabrics, dungarees, khakis, wiping towels in soft and hard water.		7930-00-929-1220 50-lb DR
	Type II—for washing woolens and synthetic-blend fabrics in soft, hard or sea water; for washing cottons in sea water.	P-D-245C	7930-00-929-1221 25-lb BX 7930-00-252-6797 50-lb DR
II.	#*DETERGENTS (Liquid Non-Ionic)		
	Type I—water soluble; for removing grease, oil and dirt.	MIL-D-16791E	7930-00-282-9699 GL 7930-00-985-6911 (5-gal) CN
III.	DETERGENT, Drycleaning	MIL-D-12150C	7930-00-234-6237 GL
	For use in fabric drycleaning equipment with synthetic chlorinated hydrocarbons.		
IV.	TETRACHLOROETHYLENE (Perc)	O-T-236	6810-00-270-9982 (55-gal) DR
	Drycleaning solvent for cleaning fabrics.		

#Mandatory use for PACFLT ships; avaliable from PACFLT FILL and WESTPAC Naval Supply Depots

*Available from LANTFLT Fleet Issue Load List (Fill)

	Material	Specification	National Stock Number	
V.	#*ALKALI/BUILDER	P-D-450a	7930-00-300-0119	25-lb BX
	For use with detergents in heavy-duty laundering of cottons in soft or hard water; not intended for use with woolens, silks or synthetics		7930-00-281-1839	100-lb DR
VI.	#*BLEACH	O-B-420	6850-00-063-2842	25-lb BX
	Organic chlorine powder, 15.5 percent available chlorine.		6850-00-063-2843	50-lb DR
VII.	#*COMBINATION SOUR/BLUE	P-L-00130a	7930-00-205-2882	50-lb DR
	Used to neutralize residual alkali in fabrics or water supply and to tint uniformly cotton fabrics.			
VIII.	#*STARCH (Instant)	JJJ-S-701E	7930-00-841-6362	50-lb DR
IX.	STAIN REMOVAL			
	Acetic acid, glacial, technical; 99.5 percent	O-A-76	6810-00-275-1215	5-lb BT
	Ammonium hydroxide (ammonia), technical; 27 percent	A-A-451d, Type I	6810-00-584-3793	1-pt BT
	Hydrochloric Acid 31 percent	OH-765	6810-00-222-9641	5-pt/6-lb BT
	Magnesium sulfate (epsom salts)	U.S.P.	Obtain from sick bay	
	Oleic acid	U.S.P. Grade	6505-00-153-8216	1-pt BT
	Oxalic acid	O-O-690 Class 2	6810-00-264-3937	1-lb BT

#Mandatory use for PACFLT ships; available from PACFLT FILL and WESTPAC Naval Supply Depots

*Available from LANTFLT Fleet Issue Load List (Fill)

Appendix I–COMMONLY USED FEDERAL SUPPLY LAUNDRY PRODUCTS

	Material	Specification	National Stock Number
X.	MISCELLANEOUS		
	Hanger, coat, all steel wire, 13 gage, 500 per box		7290-00-125-9069 BX
	Net, laundry, size 24 x 36		3510-00-273-9739 EA
	Pin, net, nickel-coated brass, 5″ long, 100 per box		3510-00-222-1457 BX

#Mandatory use for PACFLT ships; available from PACFLT FILL and WESTPAC Naval Supply Depots

*Available from LANTFLT Fleet Issue Load List (Fill)

APPENDIX II

GLOSSARY

ABSORPTION. To take in or suck up, as a sponge sucks up water.

ACETATE. One of the synthetic fibers, formerly called cellulose acetate rayon.

ACETIC ACID. A general spotting agent used to neutralize alkalies, restore colors that have been damaged by alkalies, and to test some dyes. Acetic acid is used to remove tannin stains and bleed basic dyes and some acetic dyes. It may be used to accelerate some bleaches. When the full strength of acetic acid is cut to 28 percent by the addition of water, the solution may be used for spotting.

ACTIVATED CARBON. A finely ground, charred, organic black powder, that has been activated with steam to enhance its adsorptive property. Used in clarification of solvent to remove color, odor, and other impurities.

ACTIVATED CLAYS. Synthetic or natural clays that have been treated with heat and moisture to give them the powers of adsorption. Remove impurities from solvent in filtration.

ADSORPTION. To adhere or stick to the surface, as dirt sticks to adhesive tape.

ALCOHOLIC POTASSIUM HYDROXIDE (KOH 0, 139). A colorless liquid used to neutralize fatty acids in the performance of the fatty acid number test. Pink color develops when complete neutralization takes place.

AMMONIA. A colorless, water soluble, volatile liquid alkali with a pungent odor. A mild alkali used in spotting and wet cleaning. (It should be kept in a cool place in a closed container.)

AMYL ACETATE (BANANA OIL). A clear, colorless, volatile liquid used chiefly on lacquer stains. Dissolves lacquers, fingernail polish, and collodion. Exercise caution, amyl acetate is inflammable.

ANHYDROUS COPPER SUFFATE. A bluish white powder used in testing solvent for moisture. Anhydrous means dry or free of moisture. This powder turns bright blue in the presence of moisture.

ANTI-STAT/SOFTENER. A chemical agent which can be absorbed on fabrics and imparts a softness and reduces "static buildup" (clinging) on synthetic and synthetic blend fabrics, that develop during the drying cycle. BUMED Notice 6770 of 24 January 1973 specifies use of anti-stats in laundering of linens to be used in medical/dental facilities aboard ships and at shore installations.

BACTERIO-STAT. A chemical agent which can be absorbed on fabrics and inhibit the growth of bacteria. The same conditions (water level and temperature) used for souring are satisfactory for application.

BACKWASHING. Reversing flow of solvent in the tubular-type filter of the pressure unit in order to remove dirt and impurities from the screen.

BLUE. A tinting agent used in the washing process to restore whiteness of garments through a process of neutralization. Blue is a process which neutralizes the yellow color common in white clothing.

BUCK OR BOTTOM STEAM. Steam that comes up from the buck of a press through the padding. This steam is more moist than head steam and is used chiefly to remove wrinkles.

BUILT SOAP. A soap that contains an excess of free alkali which has been added to increase the cleaning action of the soap.

BUNDLE. Items of laundry or dyrcleaning contained in an order. Number of items in a bundle is usually limited.

BUTTON TRAP. A trap placed in the line between the washer and the pump to prevent insolubles from getting into the pump and clogging it.

CALCIUM. A silver-white soft metallic element. Forms compound with chlorides and sulfates to make hardness in water.

CARDING. A mechanical process of cleaning and disentangling fibers–the removal of impurities such as leaves and dirt.

CARTRIDGE FILTER. A cartridge filter that is used with drycleaning. Differs from the other types in that it is not a holder for filter powder, but is rather a self-contained filter unit that can be inserted into a housing as a unit, and later can be removed and discarded when necessary.

CELLULOSE. The basic substance found in vegetable and rayon fibers.

CENTRIFUGAL FORCE. A force which is exerted outward from the center of rotation. The force exerted against the clothes in an extractor to force out solvent or water.

CHELATING AGENT. An agent used in the decontamination of radioactive clothing.

CHEMICAL CHANGE (Action). An act where a new product or products are formed which have none of the properties or characteristics of the original substance.

CHLORINATED HYDROCARBONS. A man-made compound in which one or more atoms of hydrogen have been replaced with chlorine. These cleaning solvents differ from petroleum products and are usually referred to as synthetic solvents (perchlorethylene/tetrachloroeythylene).

CLARIFICATION OF SOLVENT. An act or process of cleaning solvent. Solvent is clarified by pressure filtration or vacuum distillation.

CLOSED HOT SYNTHETIC UNIT. A vapor-tight unit that washes, extracts, and recovers (drys) in the same wheel but is hot (heat is used during drying).

COLD AIR CYCLE. Usually a 5-minute cold air break at the beginning or end of the deodorization cycle to eliminate fire hazards.

COLD SYNTHETIC UNIT. A synthetic drycleaning unit that washes, extracts, with drying done in a separate piece of equipment.

COLLODION. A flowing solution of a flammable mixture of cellulose nitrates with less than 12.5% nitrogen used as a coating for wounds or for photographic films. Highly flammable.

CONDENSATION. A process of reducing from one form to another. In distillation, solvent vapors are condensed back to a liquid as steam is reduced to water.

CONDUCTION OF STATIC ELECTRICITY. The transfer of static charges through wires from one point to another. Static charges are dissipated to the shell of washers and follow the ground wire out. Soaps used should be good conductors of static.

COSOLVENTS. Liquids that work in harmony with each other. Sometimes referred to as coupling agents.

COTTON. A soft, white, fibrous substance that has a cellulose base; used to make cotton fabrics. A seed hair fiber.

CRACKING OF SOLVENT MOLECULES. When solvent molecules are heated above 300°F, the molecules crack and form unsaturates which pick up odor-forming materials and create odor trouble in garments.

CRITICAL FILTER PRESSURE (10 POUNDS). A critical point indicating that the filter either needs to be scraped down or cleaned out. A tightly packed precoat will cause excessive pressure even though the muck chamber is empty.

DACRON. A synthetic fiber made from terephthalic acid and ethylene glycol.

DAMP BOX. A box used to hold shirts, trousers, and linens to keep them damp until they are pressed.

DEODORANT. A preparation used to deodorize the offensive odors encountered in underarm areas of garment.

DEODORIZATION. A process of removing the solvent vapors from clothing by tumbling.

DETERGENT. A synthetic, man-made product which is a highly effective cleanser and is unaffected by hard water. Can be used in salt water.

DIATOMACEOUS EARTH. A white, fluffy, porous powder used to precoat the screens in the filter. This product is taken from the earth; it is the fossilized skeletons on minute plant life.

DISPERSE. To scatter, separate, or spread out, as soap flocks (particles) are dispersed or distributed evenly throughout the solvent in the washer.

DISSIPATE. To break up and drive off as static electricity is dissipated to the shell of the washer by soap flocks and carried out of the plant through the ground wire.

DISTILLATION. The act of changing solvent from a liquid to a vapor and then condensing solvent back to a liquid. This is done by heating the solvent. By controlling the temperature, the desired products are carried over in distillation and the undesirable products are left behind in the still kettle.

DISTILLATION RANGE. The range from the initial boiling point to the end point for a solution.

DOSAGE. The total amount of radiation received by an individual.

DOSIMETER (POCKET). An instrument used to measure the amount of radiation received by an individual.

DRYING CYCLE. The period of time garments are in the tumbler drying. A cold air break, warm air cycle, and a second cold air break are included in the drying cycle.

DRY SIDE SOLVENTS. Any liquid agents used in a drycleaning plant that are soluble in the solvent. Dry side solvents must be flushed out with the solvent unless they are volatile or the article is recleaned.

EASY CARE. Items of apparel constructed of synthetics and blends consisting of cotton and synthetic fibers, including permanent (sometimes called durable) press items.

EMULSION. A distribution of one liquid in another in which it is not soluble, such as an emulsion formed by synthetic solvent, soap, and water. An emulsion is always milky white or cream in color. A good emulsion does not settle quickly.

END POINT. The highest point at which solvent boils in the distillation range test. Anything above this point is referred to as a heavy end.

EVAPORATION. The process of changing a liquid to a vapor as synthetic solvent is evaporated in distillation. Many solvents evaporate at room temperature.

EXTRACTING. Act of extracting or drawing out, as perchlorethylene forced or extracted from garments during the extracting cycle by centrifugal force.

FATTY ACID. An organic acid that occurs in fat-like substances. Usually an oily or grease-like substance that is chiefly used in making laundry and drycleaning soaps. Fatty acids include oleic, stearic, palmitic and lauric acids. Fatty acids are also found in coconut oil, tallow, palm oil, and olive oil.

FATTY ACID NUMBER TEST. A test used by drycleaning operators to detect the presence of fatty acids in Stoddard solvent.

FEATHER OUT. A process of gradually dispersing moisture from the center of the stain outward to prevent leaving water circles or sizing rings. Feather out the area to be spotted with the steam gun before spotting the stain.

FELTED FABRICS. A fabric that is made from fibers by felting; no yarns are used.

FELTING. Tangling, matting, or interlocking of fibers. These fibers are worked into a compact material by rolling and pressure. Fibers that have felting tendencies, such as wool, hair, or fur must be used.

FILAMENT FIBERS. Long continuous fibers which can be of any length. Silk and rayon fibers are the most common filament fibers.

FILAMENT YARNS. Yarns made of filament fibers by a process of throwing. The fibers are twisted together to produce a yarn.

FILTER. A piece of equipment that has screens inside. Synthetic solvent is filtered through these screens to remove insoluble soils. Filter powders are used with a filter to remove soluble soils.

FILTRATION. The act or process of filtering. Simple filtration is the gravity flow of a liquid through a filtering medium. Pressure filtration is the same, except the flow of the liquid through the filtering medium is forced by a pump.

FLASH POINT. A point at which a liquid gives off enough vapors to cause an explosion if mixed with the proper proportion of air.

FLATWORK FINISHING. Pressing that is accomplished by the flatwork ironer, such as towels and sheets.

FRESH SOAP TO EACH BATH. Adding soap to each load of clothes. This does not refer to adding soap to a charged system. Generally termed a batch operation.

FRIEZE. A pile fabric that is used in making cold weather clothing. It has uncut loops on each side of the fabric and appears as a terry towel. This gives better insulating qualities to the fabric.

GEIGER-MUELLER COUNTER (RADIAOMETER). An instrument used to detect and measure the intensity of radiation.

GEL SOAP. A soap that contains a high moisture content. Never add moisture to a gel soap or it will break down.

GENERAL FORMULA. An acid solution containing several different ingredients. Used on tannin stains and as a general spotting agent. General formula is used on the wet side and should be flushed out with water. This agent is hard on color and should never be heated with the steam gun.

HAIR FIBER. Any fiber that grows from the surface or skin of an animal is for all practical purposes called a hair fiber.

HALIDE DETECTOR. A device to locate the source of leakage of chlorinated hydrocarbon (pychlorethylene, tetrachoroethylene) solvents used in the synthetic drycleaning process.

HEAD. The top portion of a press that is brought down against the fabric during the pressing operation.

HEAD STEAM. Steam that comes from the perforations of the press head when the head valve is opened. Most commonly used for setting creases because it is drier than buck steam.

HYDROFLUORIC ACID (ERUSTICATOR). A colorless, volatile, fuming, corrosive acid that is used to remove rust and tannin stains. Dissolves glass.

HYDROGEN PEROXIDE. A mild, liquid, oxidizing bleach that is very unstable and hard to store. Used chiefly on organic stains (blood stains on wools).

IFI. International Fabricare Institute provides a test piece and solvent test program for the laundry/drycleaning industry.

INTERFACIAL TENSION. The force that is manifested between two liquids that keep them from going into solution together.

ION. An electrically charged atom or group of atoms.

IRON. A metallic element that is found in hard water.

KNITTED FABRIC. A fabric made by knitting, such as jersey.

KNITTING. A process of interlacing a series of loops using one or more sets of yarns.

LACES. Fabrics usually used to trim garments and considered to be fragile and difficult to process from a drycleaner's point of view.

LAY. The act of making a lay on a garment when pressing, such as the collar lay and the right chest lay.

LEAVE-OFF MARK. A mark that is left on a garment that is caused by excessive head pressure or other faulty finishing procedures.

LINEN COUNTER. A device used to determine the type of weave used in making a fabric. The same as a magnifying glass. A linen counter usually enlarges the fiber 20 times its original size. This tool is helpful in stain identification.

LOT. A predetermined amount of clothing. Lots are usually determined by weight, and each lot is equal to the capacity in pounds of the machine. If a washer runs 150 pounds, then each load would be equal to a lot.

LUSTER. The light reflection of a surface. Generally referred to as the shine or glossy appearance of a fabric.

MAGNESIUM. A metallic element that is found in hard water.

MECHANICAL ACTION. The force that is applied as an expedient in the removal of soil.

MERCERIZED COTTON. Cotton that has been treated with a solution of caustic soda or a strong alkali to make the fibers stronger and more receptive to dyes. This fabric has greater luster than ordinary cotton.

METALLIC FABRIC. A fabric that is made of cloth and has metallic yarns mixed in with the material. Rust removers and bleach are not to be used on these fabrics.

METALLIC ORNAMENTS. Articles that are attached to fabrics and require special handling.

METHANOL. A wood alcohol that is used chiefly in drying test tubes and in removing dye stains.

METHYL ORANGE. An acid indicator that is used to detect the presence of acids in drycleaning solvent.

MIXTURE. A substance that consists of a combination of several ingredients which are combined together but do not react chemically. Each ingredient retains its own properties and has a separate existence.

MODIFIED SODA. A combination of sodium bicarbonate and soda ash. A 0.1 percent solution of modified soda has a pH of 10.0 on the alkaline side.

MOISTURE ABSORBER. Equipment in the distillation unit commonly referred to as the rag filter. It is cylindrically shaped and filled with damp cotton rags. Its chief purpose is to remove moisture, fatty acids, and cosolvents that pass over from the distillation unit.

MONITORING INSTRUMENT. An instrument that measures radioactivity or intensity of radioactivity. A radiometer is one type of instrument used.

MUCK. The residue that is left in the bottom of the distillation unit or filter after each operation. The soils that are removed from solvent during clarification. When the filter is cleaned, muck is removed from the bottom of the filter.

NAPPED FABRIC. A fabric that is made of large yarns and napped by abrasion. A blanket is a good example of a napped fabric.

NEUTRAL LUBRICANT. A synthetic detergent that is used because of its great penetrating and lubricating powers.

NEUTRAL SOAP (PERTAINS ONLY TO DRYCLEANING). A soap that does not contain any free alkali. "Neutral" does not refer to pH value.

NET. A fabric made by knitting and which appears as a net. These fabrics are difficult to handle and require special handling.

NYLON. A fabric made from synthetic fibers derived from coal, air, and water.

ORLON. A synthetic acrylic fiber chemically composed of acrylonitrile.

OXIDIZING BLEACH. A bleaching agent that gives up its oxygen to the fabric or stain in the presence of water.

OXYCELLULOSE. Cellulose that has been chemically converted into a new substance by over-oxidation.

PASS UPS. Garments or fabrics that are free of stains or fabrics on which stains are recognized as permanent. Fabrics are forwarded to the finishing department after the spotter makes his inspection.

PASTE SOAP. A soap which contains a high percentage of true soap and free fatty acids. This soap has greater cleansing power than any of the other soap but is the most difficult to use.

PENETRATION. The act of penetrating or entering. Neutral lubricant is added to certain baths to increase the penetrating power of the solution.

PERCHLORETHYLENE. See Tetrachloroethylene.

PERMANENT HARDNESS IN WATER. Metallic minerals found in water that decompose true soaps. These minerals are calcium, magnesium, and iron.

pH. A symbol that denotes the potential hydrogen (acid) or hydroxyl (alkali) ion concentration of a solution or substance. It is in reality a measure of the acidity or alkalinity of a solution or substance. pH values run from 0 to 14, and 7 indicates that the solution is neutral. Numbers below 7 increase the acidity and numbers above 7 increase the alkalinity.

PHENOLPHTHALEIN SOLUTION. A white, colorless liquid that is used as an alkali indicator. The liquid turns purplish-red when alkalies are present. Used chiefly for testing drycleaning solvent.

PIGMENT PRINT. A fabric that has the design made with a pigment. A finely ground insoluble pigment is mixed with a synthetic binder to make the design which is never very prominent on the inside and usually appears as paint on the right side of the fabric. Always test before processing to determine whether the binder is soluble in water or synthetic solvent.

PLAIN WEAVE. The simplest weave used in making fabrics. One set of filler and warp yarns are used. A filler yarn passes alternately over and under one warp yarn, back and forth across the fabric.

PLASTIC AND PLIABLE. Capable of being modeled or shaped with a desired design. Steam makes fabrics plastic and pliable, so they can be restored to their original finish.

PLY. Denotes the number of strands of fibers that are twisted together in a yarn. Two-ply yarn means that two strands are twisted together to make the yarn.

POLYSTYRENE BUTTONS. Buttons made of a plastic substance that will be dissolved by cleaning solvents. These buttons look like glass and should be tested before cleaning with a volatile-type paint remover to determine if they are glass or polystyrene plastic.

PRACTICAL BURNING TEST. A burning test performed on fibers to determine the basic contents of the fiber. The results are confirmed by the way the fiber burns, the odor given off, and the appearance of the ash.

PRECOAT. The cake of powder that forms on the filter screens. A wire mesh cannot be made that is small enough to filter the soils from the solvent.

PRESPOTTING. The act of spotting garments before cleaning.

PRESPOTTING SOAP. A special soap that is used for prespotting stains.

PREVENTIVE MAINTENANCE. Any precautionary act or measure, such as lubricating, greasing, and cleaning, that is taken to prevent damage to equipment.

PRODUCTION STANDARDS. The amount of work done in a specific period of time by the average, efficient operator. These standards are used to determine operator and plant efficiency.

PROTEIN. The basic substance found in animal fibers, such as wool and silk.

RADIATION. The act of radiating. To emit energy from molecules and atoms due to internal changes. To spread out rays from a center.

RADIOACTIVE CONTAMINATION. A material contaminated with radioactive particles.

RADIOACTIVE TOLERANCE LEVEL. The degree of radioactivity above which physiologically harmful effects result.

RADIOACTIVITY. A process whereby certain elements undergo spontaneous atomic disintegration in which energy is liberated. The process is accompanied by the emission of one or more types of radiation, such as alpha particles, beta particles, or gamma radiation.

RAYON. A fiber made by forcing a viscous solution of modified cellulose through minute holes and then drying the filaments. Also a fiber made from this material.

REDUCING BLEACH. A bleaching agent that takes away oxygen from the fabric or stain in the presence of water.

RINSE CYCLE. The period of time it takes the filter to rinse the solvent in the washer; 15 times is normally considered a rinse cycle.

SAFETY PRECAUTIONS. Any act or measure that should be carried out to prevent injury to operators.

SANFORIZED COTTON. A trade mark applied to cotton or linen fabrics which means that the material has been treated prior to making it into a fabric to prevent more than 1/4-inch shrinkage in length or width per yard.

SATEEN. A cotton fabric made from spun yarns and a satin weave to give it a glossy finish. The floating yarn is the filler yarn, and the warp yarn is of high twist to give strength to the fabric.

SATIN. A fabric made from filament yarns such as silk, rayons, or nylon which produces a high luster. The warp yarn is the floating yarn and the filler yarn is of high twist to give strength to the fabric. The floating yarn passes over four to eight filler yarns, then one filler yarn, back and forth across the fabric.

SEED HAIR FIBER. Any fiber that grows from the surface of a seed, such as cotton.

SILK. A fine, strong, lustrous fiber which has a protein base and is produced by the silk worm.

SIZING. A substance added to a fabric to give stiffness, weight, drape, feel, or luster. Starch is a form of sizing that is added to shirts to produce stiffness.

SLIDE FASTENER. A zipper. (Always close slide fasteners before processing garments.)

SOAP CYCLE. The length of time a load of garments is machine washed with soap.

SOAP FLOCK. A particle of soap known as a soap flock. It floats around in the solution and picks up soil.

SOAP SPECKS. Black or grey spots which result from the flocculation of dirt and soap due to poor washroom control and technique.

SODIUM BISULFITE. The mildest of the reducing bleaches. Used to remove slight dye stains and to reduce maganese dioxide left in the fabric after it is bleached with potassium permanganate.

SODIUM HYPOCHLORITE. A strong oxidizing bleach used chiefly on linens and cottons in the laundry. Sometimes used to bleach small areas in spotting. Commonly known as Javelle water, Chlorox, or White Magic. A 1% concentration is generally used for bleaching purposes.

SODIUM METASILICATE, ORTHOSILICATE, SESQUISILICATE. Strong alkalies; their pH values are too high to warrant their use for wet-cleaning purposes. These alkalies are used chiefly to build laundry soaps.

SODIUM PERBORATE. The mildest of the oxidizing bleaches. A white powder that is accelerated by heat and used chiefly on yellow organic stains.

SOLVENT ACTION. The dissolving action of a solvent on soiled garments.

SOLVENT LEVEL. The amount of solvent in the washer. Level is measured in inches on the inside of the cylinder. A 10-inch solvent level would mean the solvent in the washer reaches a height of 10 inches on the inside of the cylinder.

SOURING. A process of neutralizing the alkalinity in a garment by using one of the mild acids or acid salts. Generally used on the last rinse cycle of the washing formula in a laundry.

SPATULA. A knifelike implement made of bone or plastic and used to increase the penetration or spread out thick spotting agents. Commonly referred to as a bone scrape.

SPINNING. A process of spinning staple fibers into yarns. This is done by a spinning machine.

SPUN YARNS. Yarns that are made from staple fibers.

STABILITY OF SOAP. A soap with satisfactory stability, which forms a good emulsion with water and solvent, and which will not settle out rapidly. Not all soaps are stable.

STAPLE FIBERS. Short fibers that are measured in inches from 1/8 to 8 inches long. Cotton and wool are made of staple fibers.

STARCHING. A process of adding a sizing to a garment to give it stiffness.

STRONG SOAP SOLUTION. A charge whereby a certain percentage of soap is mixed with the solvent in the washer and filter system. This soap is not removed during the filtering cycle. The system is often referred to as a charged system.

SUCTION TEE. A specially constructed valve used on the distillation unit to create a vacuum.

SUSPENSION. The solution in which solids are finely dispersed and held in suspension by a liquid or solid, as soil is held in suspension by soaps.

SWEETENER POWER. Activated clays or filter aids that will remove both soluble and insoluble soils from drycleaning solvent.

TEMPORARY HARDNESS IN WATER. Calcium, magnesium, or iron in compound with bicarbonate. Temporary hardness is reduced by boiling.

TEST PIECE. A controlled soil/stain swatch of cloth provided by the IFI (under a subscription program) to ascertain the effectiveness of laundry/drycleaning procedures.

TETRACHLOROETHYLENE (Perchlorethylene). A colorless liquid; chloroform-like odor. Has a boiling point of 250°F and weight of 13.6 pounds per gallon. It is used as a drycleaning solvent in synthetic drycleaning units. One of the chlorinated hydrocarbons. Not corrosive or dangerously reactive, but toxic by inhalation, by prolonged or repeated contact with the skin or mucous membrane or ingested by mouth. The liquid can cause injuries to the eyes; however, with proper precautions it can be handled safely.

THROWING. The process of twisting two or more filament fibers together into a yarn. This done with a throwing machine.

TITANIUM SULFATE. A purple liquid reducing bleach used chiefly on dye stains for spot bleaching.

TRUE SOAP. A soap is made from true fats and oils; no synthetic products are used.

TUMBLING. A process of drying clothes in a tumbler.

TWILL WEAVE. The most durable of all the weaves used in making a fabric. There are variations of the twill weave. Gabardine, serge, and Army clothing are made with a twill weave.

TWIST. A term which indicates the number of twists per inch in yarn.

VACUUM. A space that is void of air. A vacuum is pulled on the still kettle of the distillation unit, and this lowers the boiling point of Stoddard solvent.

VELVET. A fabric usually made from rayons using the pile weave. Requires special handling to process.

VELVETEEN. The same fabric as velvet except velveteen is always made of cotton.

VICARS. A fiber made from corn protein.

VINYL RESIN PLASTIC. A fabric that has been coated with a resinous material that is sometimes soluble in solvent.

VISCOSE. A solution made by treating cellulose with a caustic alkali solution and carbon disulfide. Used in making rayons.

VOLATILE. Vaporizes easily. In laundry and drycleaning relates to a volatile oil that is used in spotting.

WARM AIR CYCLE. A 20- to 30-minute cycle that is run between the two cold air cycles in tumbling or drying garments.

WASHING FORMULA. A standard prescribed procedure established for washing certain types of clothing.

WATERPROOFING. A factory process which completely seals the pores of a fabric, making it waterproof. This type of garment is hot and uncomfortable to wear because the garment cannot breathe.

WATER REPELLENT. A process of coating the yarns with a waxlike substance. This does not make the fabric waterproof or uncomfortable to wear, as the fabric can still "breathe."

WET AND DRY SOLVENT. A solvent that is soluble in water or drycleaning solvent. Pyridine can be used as a wet or dry solvent.

WET SOLVENT. A solvent that is soluble in water and used as a wet-side spotting agent.

WET SPOTTER. An alkaline spotting agent used on various types of stains.

WETTING AGENT. A soap or synthetic detergent.

WOOLEN. A garment made of wool fibers that have been carded. Woolen has a soft finish.

WORKMANSHIP PRECAUTION. Any act or measure that will prevent damage to the material or equipment.

WORSTED WOOL. A garment made of wool fibers that have been carded and combed. A worsted garment is more durable than a woolen and has a harder finish.

ZEOLITE. A substance that looks like coal cinders. When charged with sodium chloride (salt), it gives up its salt for metallic elements such as calcium, magnesium, and iron.

APPENDIX III

THE METRIC SYSTEM

The metric system was developed by French scientists in 1790 and was specifically designed to be an easily used system of weights and measures to benefit science, industry, and commerce. The metric system is calculated entirely in powers of 10, so one need not work with the various mathematical bases used with the English system, such as 12 inches to a foot, 3 feet to a yard, and 5280 feet to a mile.

The system is based on the "meter" which is one ten-millionth of the distance from the Equator to the North Pole. It is possible to develop worldwide standards from this base of measurement. The metric system of weights is based on the gram, which is the weight of a specific quantity of water.

Soon after the system was developed scientists over the world adopted it and were able to deal with the mathematics of their experiments more easily. The data and particulars of their work could be understood by other scientists anywhere in the world. During the early 19th century many European nations adopted the new system for engineering and commerce. It was possible for these countries to trade manufactured goods with one another without worrying whether it would be possible to repair machinery from another country without also buying special wrenches and measuring tools. Countries could buy and sell machine tools and other sophisticated and precision machinery without troublesome modifications or alterations. It was much easier to teach the metric system, since meters can be changed to kilometers or centimeters with the movement of a decimal point, which is roughly like being able to convert yards to miles or inches by adding zeros and a decimal instead of multiplying by 1760 or dividing by 36.

With the exception of the United States, all the industrialized nations of the world have adopted the metric system. Even England and Canada are changing from their traditional systems of measure, and the metric system will be almost universal by 1980.

Although the metric system has not been officially legislated by the Congress, the metric system is becoming more prominent in this country. Most automobile mechanics own some metric wrenches to work on foreign cars or foreign components in American cars. Almost all photographic equipment is built to metric standards. Chemicals and drugs are usually sold in metric quantities, and "calorie counters" are using a metric unit of thermal energy.

Because we are allied with countries who use the metric system, much of our military information is in metric terms. Military maps use meters and kilometers instead of miles, and many weapons are in metric sizes, such as 7.62 mm, 20 mm, 40 mm, 75 mm, and 155 mm. Interchange of military equipment has caused a mixture of metric and English measure equipment since World War I when the army adopted the French 75 mm field gun, and World War II when the Navy procured the Swedish 40 mm Bofors and the Swiss 20 mm Oerlikon heavy machine guns.

It is inevitable that the United States will officially adopt the metric system. Exactly when this happens and how rapidly the changeover will depend on economics, since the expense of retooling our industry and commerce to new measurements will be very great. The cost of conversion will be offset by increased earnings from selling machinery and products overseas. Another benefit is that scientists use the metric system, but their calculations now have to be translated into English measure to be used by industry. With adoption of the metric system ideas can go directly from the drawing board to the assembly line.

The Navy will be using the metric system more during the next few years. Although you will find it easier to solve problems using this system, at first you will find it difficult to visualize or to estimate quantities in unfamiliar units of measure.

Fortunately, many metric units can be related to equivalent units in the English system.

The meter which is the basic unit is approximately one-tenth longer than a yard.

The basic unit of volume, the liter, is approximately one quart. The gram is the weight of a cubic centimeter, or milliliter, of pure water and is the basic unit of weight. As a common weight though, the kilogram, or kilo, which equals the weight of a liter of water, weighs 2.2 pounds. The cubic centimeter (cc) is used where we would use the square inch, and where we measure by the fluid ounce, the metric system employs the milliliter (ml). For power measure the metric system uses the kilowatt (kW), which is approximately 1.3 horsepower.

In terms of distance, a land mile is eight-fifths of a kilometer and a nautical mile is 1.852 kilometers, or nearly 2 kilometers.

A basic metric expression of pressure is the kilogram per square centimeter, which is 14.2 psi, nearly 1 atmosphere of pressure.

When working on foreign machinery, you may notice that your half-inch, three-quarter inch, and one-inch wrenches will fit many of the bolts. These sizes correspond to 13 mm, 19 mm, and 26 mm respectively in the metric system, and are very popular because they are interchangeable. The 13/16-inch spark plug wrench, which is standard in this country, is intended to fit a 20 mm nut.

The basic quantities of the metric system are multiplied or divided by powers of 10 to give other workable values. We cannot easily measure machine parts in terms of a meter, so the millimeter, or one-thousandth of a meter is used. For very fine measure the micron, also called the micrometer, can be used. It is one-millionth part of a meter, or one-thousandth of a millimeter. For small weights the milligram, one-thousandth of a gram is used. All of these multiples are expressed with standard prefixes taken from Latin:

micro	= 1/1,000,000
milli	= 1/1,000
centi	= 1/100
*deci	= 1/10
*deca	= 10
*hecto	= 100
kilo	= 1,000
*myria	= 10,000
mega	= 1,000,000

* Rarely used

Over the next few years the metric system will become more used by the Navy as well as by the civilian world. You will find it easy to work with once you have mastered the basic terms. It will be difficult to translate values from our present system to the metric system, but this operation will become unnecessary once the new measurements are totally adopted.

Tables of equivalent English measure and metric equivalents are essential when you work simultaneously with both systems. The table which follows shows the equivalent measures of the two systems. The columns on the left have the equivalent values which are accurate enough for most work, and on the right are the multiples used to convert the values with a high degree of accuracy.

U.S. CUSTOMARY AND METRIC SYSTEM UNITS OF MEASUREMENTS

THESE PREFIXES MAY BE APPLIED TO ALL SI UNITS

Multiples and Submultiples	Prefixes	Symbols
1 000 000 000 000 = 10^{12}	tera (tĕr'ȧ)	T
1 000 000 000 = 10^{9}	giga (jĭ'gȧ)	G
1 000 000 = 10^{6}	mega (mĕg'ȧ)	M •
1 000 = 10^{3}	kilo (kĭl'ô)	k •
100 = 10^{2}	hecto (hĕk'tô)	h
10 = 10	deka (dĕk'ȧ)	da
0.1 = 10^{-1}	deci (dĕs'ĭ)	d
0.01 = 10^{-2}	centi (sĕn'tĭ)	c •
0.001 = 10^{-3}	milli (mĭl'ĭ)	m •
0.000 001 = 10^{-6}	micro (mī'krô)	μ •
0.000 000 001 = 10^{-9}	nano (năn'ô)	n
0.000 000 000 001 = 10^{-12}	pico (pē·kô)	p
0.000 000 000 000 001 = 10^{-15}	femto (fĕm'tô)	f
0.000 000 000 000 000 001 = 10^{-18}	atto (ăt'tô)	a

• MOST COMMONLY USED

Appendix III–THE METRIC SYSTEM

Multiply	By	To Obtain
Acres	40.47	Ares
Acres	4,047	Centares
Acres	10	Square chains
Acres	43,560	Square Feet
Acres	4,840	Square Yards
Ares	0.02471	Acres
Ares	100	Centares
Ares	1,076	Square Feet
Ares	119.6	Square Yards
Barrels (U.S., dry)	3.281	Bushels
Barrels (U.S., liquid)	4.21	Cubic Feet
Barrels (U.S., liquid)	31.5	Gallons
Board Feet (1' x 1' x 1')	144	Cubic inches
Cable lengths (U.S.)	120	Fathoms
Cable lengths (U.S.)	720	Feet
Cable lengths (U.S.)	240	Yards
Centares	10.76	Square feet
Centares	1.196	Square Yards
Centimeters	0.3937	Inches
Cubic Centimeters	0.06102	Cubic Inches
Chains	66	Feet
Chains	100	Links
Chains	4	Rods
Cubic Feet	1,728	Cubic Inches
Cubic Feet	0.02832	Cubic Meters
Cubic Feet	0.03704	Cubic Yards
Cubic Feet	6.229	Gallons (British)
Cubic Feet	7.481	Gallons (U.S.)
Cubic Feet	28.316	Liters
Cubic Inches	16.39	Cubic Centimeters
Cubic Inches	0.0005787	Cubic Feet
Cubic Inches	0.003606	Gallons (British)
Cubic Inches	0.004329	Gallons (U.S.)
Cubic Inches	0.01639	Liters
Cubic Meters	35.31	Cubic Feet
Cubic Meters	1.308	Cubic Yards
Cubic Yards	27	Cubic Feet
Cubic Yards	0.7646	Cubic Meters
Cubic Yards	764.6	Liters
Degrees (C.)+ 17.8	1.8	Degrees (F.)
Degrees (F.) –32	0.5556	Degrees (C.)
Degrees	0.01745	Radians
Fathoms	0.00833	Cable Lengths (U. S.)
Fathoms	6	Feet
Fathoms	1.8288	Meters

Multiply	By	To Obtain
Feet	30.48	Centimeters
Feet	0.1667	Fathoms
Feet	0.3048	Meters
Feet per Minute	0.01136	Miles per Hour
Feet per Second	0.5921	Knots
Feet per Second	18.288	Meters per Minute
Feet per Second	0.6818	Miles per Hour
Furlongs	10	Chains
Furlongs	660	Feet
Furlongs	40	Rods
Furlongs	220	Yards
Gallons (British)	4,546.1	Cubic Centimeters
Gallons (British)	0.1605	Cubic Feet
Gallons (British)	277.274	Cubic Inches
Gallons (British)	1.2009	Gallons (U.S.)
Gallons (British)	4.546	Liters
Gallons (British)	4	Quarts (British)
Gallons (U.S.)	0.03175	Barrels (liquid, U.S.)
Gallons (U.S.)	3,785.4	Cubic Centimeters
Gallons (U.S.)	0.13368	Cubic Feet
Gallons (U.S.)	231	Cubic Inches
Gallons (U.S.)	0.8327	Gallons (British)
Gallons (U.S.)	3.785	Liters
Gallons (U.S.)	4	Quarts (U.S.)
Grams	15.43	Grains
Grams	0.001	Kilograms
Grams	1,000	Milligrams
Grams	0.03527	Ounces (avoirdupois)
Hands	10.16	Centimeters
Hands	4	Inches
Hectares	2.471	Acres
Hectares	100	Ares
Hectoliters	0.1	Cubic Meters
Hectoliters	26.417	Gallons (U.S.)
Hectoliters	100	Liters
Hogsheads	2	Barrels (Liquid, U.S.)
Hogsheads (U.S.)	63	Gallons (U.S.)
Hundredweights	0.508	Quintals (metric)
Inches	72	Points
Inches	6	Picas
Inches	6	Ems
Inches	12	Ens
Inches	2.54	Centimeters

Multiply	By	To Obtain
Inches	0.0833	Feet
Inches	1,000	Mils
Inches	0.0277	Yards
Inches of Mercury	0.49131	Pounds per Square Inch
Kilograms	1,000	Grams
Kilograms	2.2046	Pounds (Avoirdupois)
Kiloliters	1	Cubic Meters
Kiloliters	1.308	Cubic Yards
Kiloliters	264.18	Gallons (U.S.)
Kiloliters	1,000	Liters
Kilometers	4.557	Cable Lengths
Kilometers	3,280.8	Feet
Kilometers	39,370	Inches
Kilometers	1,000	Meters
Kilometers	0.5396	Miles, Nautical
Kilometers	0.62137	Miles, Statute
Kilometers	1,093.6	Yards
Knots	1.1516	Statute Miles per Hour
Knots	1.688	Feet per Second
Leagues, Nautical	25.33	Cable Lengths
Leagues, Nautical	5.5597	Kilometers
Leagues, Nautical	3	Miles, Nautical
Leagues, Statute	4.8280	Kilometers
Leagues, Statute	3	Miles, Statute
Links	7.92	Inches
Liters	1,000	Cubic Centimeters
Liters	61.025	Cubic Inches
Liters	0.21998	Gallons (British)
Liters	0.26418	Gallons (U.S.)
Liters	0.8799	Quarts (British)
Liters	0.908	Quarts (U.S., dry)
Liters	1.0567	Quarts (Liquid, U.S.)
Meters	100	Centimeters
Meters	0.001	Kilometers
Meters	1.0936	Yards
Meters	3.281	Feet
Meters	39.37	Inches
Meters	1,000	Millimeters
Meters	1.0936	Yards
Meters per Minute	0.0547	Feet per Second
Meters per Second	2.237	Miles per Hour
Microns	0.001	Millimeters
Miles, Nautical	8.44	Cable Lengths
Miles, Nautical	6,076.1	Feet
Miles, Nautical	72,963	Inches
Miles, Nautical	1.8532	Kilometers
Miles, Nautical	1,853.2	Meters
Miles, Nautical	1.1508	Miles, Statute
Miles, Nautical	1	Minutes of Latitude
Miles, Nautical	2,026.8	Yards
Miles per Hour (Statute)	88	Feet per Minute
Miles per Hour (Statute)	1.467	Feet per Second
Miles per Hour	0.8684	Knots
Miles, Statute	7.33	Cable Lengths
Miles, Statute	5,280	Feet
Miles, Statute	8	Furlongs
Miles, Statute	63,360	Inches
Miles, Statute	1.6093	Kilometers
Miles, Statute	1,609.3	Meters
Miles, Statute	0.8689	Miles, Nautical
Miles, Statute	1,760	Yards
Millier (See Tons – Metric)		
Milliradians	206.265	Seconds of Arc
Mils	0.001	Inches
Myriameters	10	Kilometers
Ounces (avoirdupois)	28.3495	Grams
Pint (Liquid, U.S.)	4	Gills (U.S.)
Pint (Liquid, Br.)	4	Gills (British)
Pint (Liquid, Br.)	0.56825	Liters
Pint (Liquid, U.S.)	0.4732	Liters
Pounds (avoirdupois)	7,000	Grains
Pounds (avoirdupois)	453.59	Grams
Pounds (avoirdupois)	0.4536	Kilograms
Pounds (avoirdupois)	16	Ounces
Pounds (avoirdupois)	1.2153	Pounds (troy)
Pounds (troy)	0.8229	Pounds (avoirdupois)
Pounds per Square Inch	2.03537	Inches of Mercury
Quart (British)	1.1365	Liters
Quart (British)	2	Pints (British)
Quart (Liquid, U.S.)	0.9463	Liters
Quart (U.S.)	2	Pints (U.S.)
Quintals (Metric)	1.97	Hundredweights
Quintals (Metric)	100	Kilograms

Appendix III–THE METRIC SYSTEM

Multiply	By	To Obtain	Multiply	By	To Obtain
Radians	57.30	Degrees	Square Miles, Statute	259	Hectares
Rods	16.3	Feet	Square Miles, Statute	2.59	Square Kilometers
Rods	25	Links	Square Yards	0.8362	Centares
Square Centimeters	0.1550	Square Inches	Square Yards	9	Square Feet
Square Feet	0.0929	Centares	Square Yards	1,296	Square Inches
Square Feet	929	Square Centimeters	Tons (Long)	1.016	Metric Tons
Square Feet	144	Square Inches	Tons (Long)	2,240	Pounds (Avoirdupois)
Square Feet	0.1111	Square Yards			
Square Inches	6.452	Square Centimeters	Tons (Metric) (Millier)	1,000	Kilograms
Square Inches	0.006944	Square Feet			
Square Kilometers	100	Hectares	Tons (Metric) (Millier)	2,204.6	Pounds (Avoirdupois)
Square Kilometers	0.3861	Square Miles (Statute)			
			Tons (Short)	0.9072	Metric Tons
Square Meters (See Centares)			Tons (Short)	2,000	Pounds (Avoirdupois)
Square Miles, Statute	640	Acres	Yards	91.44	Centimeters
Square Miles, Statute	25,900	Ares	Yards	0.9144	Meters

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OCCUPATIONAL STANDARDS

The following provides you with a list of minimum occupational standards for Ship's Serviceman Third Class, Laundryman/Drycleaner. The official source of the occupational standards is the *Manual of Navy Enlisted Manpower and Personnel Qualifications and Occupational Standards*, NAVPERS 18068-D. The assignment numbers given opposite the occupational standards refer to assignment in the NRCC.

SHIP'S SERVICEMAN THIRD CLASS, LAUNDRYMAN/DRYCLEANER

OCCUPATIONAL STANDARDS		Covered in Assignment
54	LOGISTICS SUPPORT	
54573	Determine equipment requirements for efficient operation of activity peculiar to own specialty	1
54574	Identify nomenclature, type, and characteristics of:	
	A. Supplies common to own specialty	1
	B. Materials serviced in performance of own specialty	2,3,4
64	PERSONNEL SUPPORT	
64001	Press clothing by hand and machine	3,4
64002	Remove common stains from clothing	2,5
64005	Receive, classify, and mark clothing and maintain appropriate logs	1,4
64006	Launder clothing and other washable materials	2,5
64008	Identify types of clothing damage, determine causes, and take corrective action	5
64009	Sanitize and decontaminate clothing and fabrics affected by nuclear, biological, and chemical agents	5
64010	Control laundering process to prevent separation of bulk lots	1,2

OCCUPATIONAL STANDARDS	Covered in Assignment
64015 Perform drycleaning and deodorizing of clothing and nonwashable materials	4
94 MECHANICAL MAINTENANCE	
94506 Perform minor adjustments and preventive maintenance on equipment used in own specialty	2,3,4,5

SHIP'S SERVICEMAN LAUNDRY HANDBOOK

NAVEDTRA 10293

Prepared by the Naval Education and Training Program Development Center, Pensacola, Florida

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Your NRCC contains a set of assignments and self-scoring answer sheets (packaged separately). The Rate Training Manual, Ship's Serviceman Laundry Handbook, NAVEDTRA 10293, is your textbook for the NRCC. If an errata sheet comes with the NRCC, make all indicated changes or corrections. Do not change or correct the textbook or assignments in any other way.

HOW TO COMPLETE THIS COURSE SUCCESSFULLY

Study the textbook pages given at the beginning of each assignment before trying to answer the questions. Pay attention to tables and illustrations as they contain a lot of information. Making your own drawings can help you understand the subject matter. Also, read the learning objectives that precede the sets of questions. The learning objectives and questions are based on the subject matter or study material in the textbook. The objectives tell you what you should be able to do by studying assigned textual material and answering the questions.

At this point you should be ready to answer the questions in the assignment. Read each question carefully. Select the BEST ANSWER for each question, consulting your textbook when necessary. Be sure to select the BEST ANSWER from the subject matter in the textbook. You may discuss difficult points in the course with others. However, the answer you select must be your own. Use only the self-scoring answer sheet designated for your assignment. Follow the scoring directions given on the answer sheet itself and elsewhere in this course.

Your NRCC will be administered by your command or, in the case of small commands, by the Naval Education and Training Program Development Center. No matter who administers your course, you can complete it successfully by earning grades that average 3.2 or higher. If you are on active duty, the average of your grades in all assignments must be at least 3.2. If you are NOT on active duty, the average of your grades in all assignments of each creditable unit must be at least 3.2. The unit breakdown of the course, if any, is shown later under Naval Reserve Retirement Credit.

WHEN YOUR COURSE IS ADMINISTERED BY LOCAL COMMAND

As soon as you have finished an assignment, submit the completed self-scoring answer sheet to the officer designated to administer it. He will check the accuracy of your score and discuss with you the questions that you do not understand. You may wish to record your score on the assignment itself since the self-scoring answer sheet is not returned.

Although you complete the course successfully, the Naval Education and Training Program Development Center will not issue you a letter of satisfactory completion. Your command will make a note in your service record, giving you credit for your work.

WHEN YOUR COURSE IS ADMINISTERED BY THE NAVAL EDUCATION AND TRAINING PROGRAM DEVELOPMENT CENTER

After finishing an assignment, go on to the next. Retain each completed self-scoring answer sheet until you finish all the assignments in a unit (or in the course if it is not divided into units). Using the envelopes provided, mail your self-scored answer sheets to Naval Education and Training Program Development Center where the scores will be verified and recorded. Make sure all blanks at the top of each answer sheet are filled in. Unless you furnish all the information required, it will be impossible to give you credit for your work. You may wish to record your scores on the assignments since the self-scoring answer sheets are not returned.

The Naval Education and Training Program Development Center will issue a letter of satisfactory completion to certify successful completion of the course (or a creditable unit of the course). To receive a course-completion letter, follow the directions given on the course-completion form in the back of this NRCC.

You may keep the textbook and assignments for this course. Return them only in the event you disenroll from the course or otherwise fail to complete the course. Directions for returning the textbook and assignments are given on the book-return form in the back of this NRCC.

PREPARING FOR YOUR ADVANCEMENT EXAMINATION

Your examination for advancement is based on the Manual of Enlisted Manpower and Personnel Classifications and Occupational Standards (NAVPERS 18068). The sources of questions in this examination are given in the Bibliography for Advancement Study (NAVEDTRA 10052). Since your NRCC and textbook are among the sources listed in this bibliography, be sure to study both in preparing to take your advancement examination. The occupational standards for your rating may have changed since your course and textbook were printed, so refer to the latest editions of NAVPERS 18068 and NAVEDTRA 10052.

NAVAL RESERVE RETIREMENT CREDIT

This course is evaluated at 8 Naval Reserve retirement points, which will be credited upon satisfactory completion of the entire course. These points are creditable to personnel eligible to receive them under current directives governing the retirement of Naval Reserve personnel.

Credit cannot be given again for this course if the student has previously received credit for completing another Ship's Serviceman Laundry NRCC.

COURSE OBJECTIVE

In completing this Nonresident Career Course, you will demonstrate a knowledge of the subject matter by correctly answering questions on the following: performing major duties and responsibilities of the Laundryman; operating laundry equipment such as washer-extractors, tumbler-dryers, presses, and flatwork ironers, to wash and finish washable garments; spotting, cleaning, drying, deodorizing, and pressing nonwashable clothing and materials using equipment such as dry cleaning machines, steam presses, steam-air-finishers, and steam cabinets; knowing the effects of Navy washing formulas, cleaning solvents, stain removing agents, and heat in cleaning fabrics of various textures; planning the flow of work, distributing and coordinating duties; maintaining records; and training assistants in shipboard laundry facilities.

Naval nonresident career courses may include a variety of items -- multiple-choice, true-false, matching, etc. The items are not grouped by type; regardless of type, they are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Some courses use many types of items, others only a few. The student can readily identify the type of each item (and the action required of him) through inspection of the samples given below.

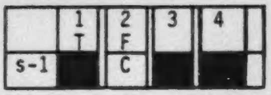
MULTIPLE-CHOICE ITEMS

Each item contains several alternatives, one of which provides the best answer to the item. Select the best alternative and erase the appropriate box on the answer sheet.

SAMPLE

s-1. The first person to be appointed Secretary of Defense under the National Security Act of 1947 was
1. George Marshall
2. James Forrestal
3. Chester Nimitz
4. William Halsey

The erasure of a correct answer is indicated in this way on the answer sheet:



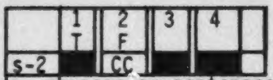
TRUE-FALSE ITEMS

Determine if the statement is true or false. If any part of the statement is false the statement is to be considered false. Erase the appropriate box on the answer sheet as indicated below.

SAMPLE

s-2. Any naval officer is authorized to correspond officially with a bureau of the Navy Department without his commanding officer's endorsement.

The erasure of a correct answer is also indicated in this way on the answer sheet:



MATCHING ITEMS

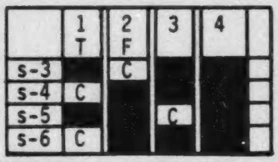
Each set of items consists of two columns, each listing words, phrases or sentences. The task is to select the item in column B which is the best match for the item in column A that is being considered. Specific instructions are given with each set of items. Select the numbers identifying the answers and erase the appropriate boxes on the answer sheet.

SAMPLE

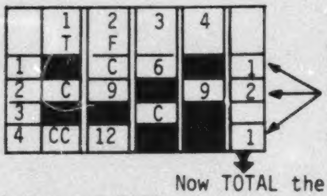
In items s-3 through s-6, match the name of the shipboard officer in column A by selecting from column B the name of the department in which the officer functions.

A. Officers	B. Departments
s-3. Damage Control Assistant	1. Operations Department
s-4. CIC Officer	2. Engineering Department
s-5. Assistant for Disbursing	3. Supply Department
s-6. Communications Officer	

The erasure of a correct answer is indicated in this way on the answer sheet:



How To Score Your Immediate Knowledge of Results (IKOR) Answer Sheets



Total the number of incorrect erasures (those that show page numbers) for each item and place in the blank space at the end of each item.

Sample only

Number of boxes erased incorrectly	0-2	3-7	8-
Your score	4.0	[✓ 3.9]	3.8

Now TOTAL the column(s) of incorrect erasures and find your score in the Table at the bottom of EACH answer sheet.

NOTICE: If, on erasing, a page number appears, review text (starting on that page) and erase again until "C", "CC", or "CCC" appears. For courses administered by the Center, the maximum number of points (or incorrect erasures) will be deducted from each item which does NOT have a "C", "CC", or "CCC" uncovered (i.e., 3 pts. for four choice items, 2 pts. for three choice items, and 1 pt. for T/F items).

Assignment 1

Administration of Ship's Service Activities; Laundry Organization and Management; Fibers and Fabrics

Textbook Assignment: Pages 1 through 38

In this course you will demonstrate that learning has taken place by correctly answering training questions. The mere physical act of indicating a choice on an answer sheet is not in itself important; it is the mental achievement, in whatever form it may take, prior to the physical act that is important and toward which nonresident career course learning objectives are directed. The selection of the correct choice for a course training question indicates that you have fulfilled, at least in part, the stated objective(s).

The accomplishment of certain objectives, for example, a physical act such as drafting a memo, cannot readily be determined by means of objective type course items; however, you can demonstrate by means of answers to training items that you have acquired the requisite knowledge to perform the physical act. The accomplishment of certain other learning objectives, for example, the mental acts of comparing, recognizing, evaluating, choosing, selecting, etc., may be readily demonstrated in a course by indicating the correct answers to training questions.

The comprehensive objective for this course has already been given. It states the purpose of the course in terms of what you will be able to do as you complete the course.

The detailed objectives in each assignment state what you should accomplish as you progress through the course. They may appear singly or in clusters of closely related objectives, as appropriate; they are followed by questions which will enable you to indicate your accomplishment.

All objectives in this course are learning objectives and questions are teaching questions. They point out important things, they assist in learning, and they should enable you to do a better job for the Navy.

This self-study course is only one part of the total Navy training program; by its very nature it can take you only part of the way to a training goal. Practical experience, schools, selected reading, and the desire to accomplish are also necessary to round out a fully meaningful training program.

Learning Objective: Identify some of the service activities available to personnel aboard ship and the regulations pertaining to the collection of fees for these services.

1-1. Which of the following services are provided for all ships with Supply Corps officers assigned?
1. Laundry, barbershop, tailorshop
2. Cobblershop, drycleaning units, vending machines
3. Vending machines, laundry, barbershop
4. Drycleaning units, laundry, tailorshop

1-2. A commanding officer may impose a charge for which of the following services?
1. Haircuts
2. Laundry
3. Shoe repair
4. All of the above

1-3. Under what condition is it necessary to collect fees for service activities?
1. When there is exceptionally heavy use of the tailorshop or drycleaning facility
2. When the ship's store profits are too low to finance the services
3. When the recreation fund is insufficient to cover costs of recreation for personnel
4. When service activity costs are unreasonably high

Learning Objective: Recognize the steps taken to ensure that the equipment in the laundry is maintained properly.

1-4. When is the machinery in the laundry inspected?
1. Before beginning daily operations
2. After firing of guns or tests of the ship's structural strength
3. Both 1 and 2 above
4. Weekly

1-5. Repairs on laundry equipment are made by
1. the laundry supervisor
2. assigned maintenance personnel
3. assigned laundry personnel
4. the engineering officer

Learning Objective: Determine some of the responsibilities of the laundry supervisor as they pertain to the supervision and training of personnel.

1-6. Which of the following practices is NOT a part of good supervision?
1. Checking the work of each individual periodically
2. Showing an interest in each man and his work
3. Correcting a worker immediately and forcefully whenever he is doing a job incorrectly
4. Telling the worker privately and pleasantly how he can improve his performance

1-7. Where can you find the minimum occupational requirements for advancement to each rate in the Ship's Serviceman rating?
1. Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards
2. Military Requirements for Advancement
3. NAVSUP Publication 487
4. Manual of Navy Enlisted Classifications

1-8. In teaching Laundrymen the knowledge and skills they will need for advancement, you should give priority to
1. safety regulations
2. machine repair
3. cleanliness in laundry spaces
4. pressing techniques

1-9. The best instructional method is to
1. assign a textbook for the trainees to study
2. give demonstrations
3. furnish instruction sheets for self study
4. use the method best suited to the situation and to the character of the material to be taught

- Information for questions 1-10 and 1-11. SH2 Faber is supervisor of the dry-cleaning unit on his ship. He has several trainees to instruct and decides on a demonstration of spot removal.

1-10. In planning the demonstration, what step should Faber take first?
1. List all the materials he will need to use
2. Ensure that the trainees are familiar with the equipment to be used in the demonstration
3. Make notes for a preliminary explanation
4. Decide what kind of spot he will remove and from what kind of fabric

A. Repeating the demonstration but having a trainee tell him how to proceed at each step

B. Supervising the trainee as he practices until he is proficient

C. Having a trainee perform the demonstration, telling at each step what he is to do next

Figure 1A

1-11. Refer to figure 1A, which lists the procedures Faber uses to test the success of his teaching and to give his trainees practice, but not necessarily in the order given. In what sequence are the procedures taken?
1. A, B, C
2. B, A, C
3. A, C, B
4. B, C, A

1-12. Faber will request needed supplies from the supply officer, getting information on what is authorized and readily available from which of the following publications?
1. Contract Bulletins
2. Ship's Store Model Stock Plan
3. NAVSUP Publication 487
4. All of the above

Learning Objective: Determine the steps taken in requesting and computing supply requirements for the laundry.

● Questions 1-13 through 1-15 deal with the factors to be considered in computing supply requirements. Each statement is to be judged True or False.

1-13. Normally, laundry and drycleaning supplies are procured as needed from vendors en route.

1-14. Supplies in storage may be checked from inventories and stock records.

1-15. Endurance is the length of time it will take to use up the supplies on hand.

● Questions 1-16 and 1-17 refer to the same ship with similar conditions for use of bleach during each period concerned.

1-16. Assume that you are estimating your needs for laundry bleach. Your stock record card shows 60 (50 lb) boxes were on hand 1 January and 20 boxes on hand 1 April. Your card also shows a delivery of 20 boxes in February. What is the indicated use rate for the three-month period?
1. 10 boxes
2. 20 boxes
3. 40 boxes
4. 60 boxes

1-17. If you need to stock supplies for a 120-day cruise, you should order enough bleach to have a stock on hand at the beginning of the cruise of at least
1. 20 boxes
2. 40 boxes
3. 60 boxes
4. 80 boxes

1-18. A laundry supervisor on an aircraft carrier who requests supplies from the supply officer first lists his needs on
1. a plain piece of paper
2. Intrastore Transfer Data (NAVSUP Form 973)
3. Number Control (NAVSUP Form 980)
4. Request for Issue or Turn-in (DD Form 1150)

1-19. Which copies of NAVSUP Form 973 are signed by the Laundryman before they are filed?
1. Original, first copy, and third copy
2. Original and second copy
3. Second and third copies
4. Original, second copy, and third copy

Learning Objective: Determine the proper method of stowing the various articles of supplies used in the laundry.

Questions 1-20 through 1-24 pertain to approved storage practices. Select the articles from column B that should be stored as directed by each item in column A.

A. Storage Methods

1-20. Keep covered in air-tight containers

1-21. Stow in bins or boxes

1-22. Stow near place of use

1-23. Protect from moisture and hot objects

1-24. Keep under lock and key

B. Articles

1. Heavy items
2. Paper and textiles
3. Liquids
4. Small items

1-25. What supplies should be protected from mildew in a tropical climate?
1. Laundry bags
2. Leather goods
3. Calcium chlorite
4. Rust remover

Learning Objective: Recognize the steps that are taken to ensure that the ship's laundry is operated effectively.

1-26. What organizational procedures should you expect to find in a large Navy laundry?
1. As many as 50 men working
2. Each Laundryman doing a special task
3. Four sections performing one function apiece
4. All of the above

1-27. Assume that a ship has 50 officers and 400 enlisted personnel on board. Approximately how many laundrymen are required to perform the laundry function for the ship?
1. 8
2. 2
3. 6
4. 4

1-28. On a ship, such duties as preparing laundry schedules, seeing that equipment is properly maintained, ordering supplies, and training personnel are assigned to
1. the supply officer
2. the laundry supervisor
3. the laundry officer
4. a civilian manager

1-29. Which of the following conditions may result from faulty operating procedures in the laundry?
1. Injury to personnel
2. Damage to equipment
3. Damage to articles being laundered or drycleaned
4. All of the above

1-30. Which of the following factors will determine the number of hours that the ship's laundry must operate?
1. The amount of work to be processed
2. The capacity of the laundry equipment
3. The number and competence of the laundry personnel
4. All of the above

1-31. You are a laundry supervisor on a ship that has 400 officers and enlisted men aboard. What is the estimated average weekly workload?
1. 4,000 pounds
2. 7,200 pounds
3. 9,600 pounds
4. 7,800 pounds

1-32. How often should you submit a report to the supply officer of work that was processed in the laundry?
1. Daily
2. Weekly
3. Monthly
4. Biweekly

1-33. A dysentery epidemic breaks out aboard your ship resulting in an increase in laundry from the sick bay. You request and are assigned additional untrained hands. Because of the shortage of trained men aboard, the best way for you to work these untrained men into the laundry program is to
1. train a few men in each task
2. have them work in the receiving and issuing sections only
3. assign them to the finishing section
4. assign them to the washing section

Learning Objective: Identify the procedures taken for receiving and processing laundry.

1-34. What type of lots includes division laundry?
1. Individual lots
2. Flatwork lots
3. Bulk lots
4. Officers' and enlisted mens' lots

1-35. Linens from the wardroom are classified as
1. service (bulk)
2. division (bulk)
3. flatwork (bulk)
4. individual

1-36. How are laundry lists used in most ship's laundries?
1. For listing enlisted men's personal laundry that is handled in bulk lots
2. For identification of bulk lots
3. For each officer or chief petty officer to indicate the contents of his individual bundle
4. All of the above

1-37. Flags or markers are used in the washer to identify which of the following?
1. Officers' uniforms
2. Bulk lots
3. Individual bundles
4. All of the above

1-38. Clothes may be effectively washed in nets provided that you take what precaution?
1. Use nylon nets
2. Use woven nets
3. Load the nets properly
4. Put several sizes of items in each net

1-39. What is the maximum load in pounds for a 24 x 36 inch knitted net?
1. 5
2. 8
3. 10
4. 12

1-40. What size net is used for washing socks in a ship's laundry?
1. 8 x 10 inches
2. 10 x 15 inches
3. 12 x 15 inches
4. 15 x 18 inches

1-41. What is the laundry mark for LT Robert W. Foster, 217-60-7420?
1. F0200
2. RF-063
3. F2006
4. F-7420

1-42. What is the correct procedure for handling discrepancies between a ship's laundry crewman's count of a laundry bundle and the customer's count of it?
1. The head laundryman checks the bundle and informs the customer of the discrepancy through whoever brought in the laundry bundle
2. Three laundry crewmen check the bundle and inform the head laundryman if there is a discrepancy
3. The head laundryman returns the soiled bundle to the customer for a recount
4. The laundry crewman who discovers the discrepancy notes it on the laundry list

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Learning Objective: Determine the proper location of laundry marks, and how laundry marking machines are used and maintained.

1-43. Where is the laundry mark placed on a shirt?
1. On the inside neckband at center, below the fold of the collar
2. On the outside neckband at center, below the fold of the collar
3. On the inside center of the seam at the bottom of the shirt
4. On the outside center of the seam at the bottom of the shirt

1-44. Which of the following laundry marking machines has/have eight rows of type keys?
1. National Model 15
2. Lever-Principle
3. Ribbonrite
4. All of the above

1-45. How should you bring material in contact with the type of a marking machine?
1. By raising the inking arm
2. By raising the printing lever
3. By pressing the printing lever backward
4. By pressing the printing lever downward

1-46. Which of the following is/are (an) important advantage(s) of the Ribbonrite marker over other methods of marking laundry?
1. It is a more modern piece of equipment
2. It eliminates the possibility of spilling ink
3. It can be operated with one hand
4. All of the above

1-47. Which of the following procedures will prevent wrinkling of the ribbon on the Ribbonrite marking machine when the type handles are being set?
1. Keeping the printer arm down
2. Keeping the printer arm raised to its full up position
3. Removing the inking arm from the machine
4. Removing the type wheels from the machine

1-48. The type on the marking machine is cleaned with a
1. brush
2. sponge
3. chamois skin
4. chemically treated cloth

1-49. How long are type wheels of a marking machine usually soaked in cleaning compound?
1. One hour
2. Two hours
3. Overnight
4. Four hours

1-50. You can remove dissolved ink from the type wheels and drum of a laundry marking machine by
1. immersing the type wheels and drum in cold water
2. immersing the type wheels and drum in a bath of oil
3. placing the type wheels and drum under a hot-water spigot
4. placing the type wheels and drum under a cold-water spigot

1-51. The recommended way to lubricate the type wheels of a marking machine is to
1. apply oil with a squirt can
2. use a dropper and insert it in a hole next to each wheel
3. use a fine brush and apply oil to the outer surfaces
4. oil a pipe cleaner, insert it in the groove next to the wheel openings, and rotate each wheel over the pipe cleaner

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Learning Objective: Recognize the procedures used for placing laundry marks on material utilizing a marking pen.

1-52. Which of the following techniques is/are important when you are marking laundry with a pen?
1. Holding the material tightly so it cannot slip under the pen
2. Using downward strokes
3. Using only enough ink on the pen to make 6 or 7 letters or numbers at a time
4. All of the above

Learning Objective: Identify the various fibers and fabrics by class, composition, and reaction to burning.

In questions 1-53 through 1-57 select the class of fiber from column B to which the fibers in column A belong.

	A. Name of Fiber	B. Class of Fiber
1-53.	Linen	1. Animal
1-54.	Wool	2. Synthetic
1-55.	Orlon	3. Vegetable
1-56.	Nylon	4. Mineral
1-57.	Fiberglass	

1-58. Which of the following fibers retains most of its dry strength when wet?
1. Viscose
2. Acetate
3. Nylon
4. Orlon

1-59. A fabric formed by mechanical work, chemical action, and the combination of heat and moisture is said to be
1. felted
2. woven
3. synthesized
4. knitted

1-60. Which of the following fibers leaves no ash when it is burned?
1. Cellulose acetate
2. Regenerated rayon
3. Nylon
4. Pure silk

1-61. When burned, a fiber sizzles with a small flickering flame, smells like burning hair, and leaves a black, brittle ash. You should identify the fiber as either
1. weighted silk or nylon
2. wool or aralac
3. cotton or cellulose acetate
4. nylon or rayon

Learning Objective: Recognize how the laundering process affects the various types of fibers.

In answering questions 1-62 through 1-64, use the following responses:

1. Cotton
2. Wool
3. Dacron
4. Orlon

1-62. What fiber is a synthetic that picks up moisture readily, dries rapidly, and gradually loses strength in sunlight?

1-63. What fiber requires thorough rinsing, tolerates bleaching, and withstands high temperatures for pressing?

1-64. What fiber felts when subjected to hot water, overwashing, or alkaline solutions?

In answering questions 1-65 through 1-68, use the following responses:

1. Linen
2. Glass fiber material
3. Rayon
4. Nylon

1-65. What fabric does not burn and is used for curtains and drapes?

1-66. What very strong synthetic fiber is often blended with other fibers to add strength to a fabric?

1-67. What fiber derived from a plant has more strength and luster than cotton?

1-68. What fiber made from plant materials modified by chemical treatment can be damaged easily when it is wet?

1-69. Which fiber is frequently blended with wool to strengthen it and to reduce shrinkage?
1. Dacron
2. Vicara
3. Dynel
4. Orlon

In questions 1-70 through 1-72 select the fiber from column B that has the characteristics listed in column A.

	A. Characteristics	B. Fibers
1-70.	Used mainly blended with wool; is moth resistant	1. Dynel
		2. Polyester
1-71.	Garments made of this material tend to resist wrinkling when in use	3. Glass fiber material
		4. Acrilan
1-72.	A warm, strong, fire resistant fiber that resists sunlight, moth attack, and mildew, but shrinks when pressed at temperatures above 240°F	

1-73. Which of the following fabrics is badly damaged by rubbing during the washing process?
1. Nylon
2. Glass fiber material
3. Orlon
4. Linen

Assignment 2

Washing: Extracting and Drying

Textbook Assignment: Pages 39 through 65

Learning Objective: Recognize the components and types of washer-extractors, their capacities and functions, and the procedures for operating and maintaining them.

2-1. Why is the cylinder of a laundry machine perforated?
1. To allow water and suds in the bottom of the shell to enter it
2. To saturate the clothes
3. To clean the clothes during the running process
4. To reduce the weight of the machine

2-2. When should you fill the automatic dispenser of a washer-extractor?
1. Daily
2. Prior to the start of each load
3. As each ingredient is inserted into the washer-extractor
4. As soon as the low level is reached

In questions 2-3 through 2-6, select the equipment/part from column B that is most suitable for the purpose in column A.

A. Purpose

2-3. To wash clothes and then immediately extract them

2-4. To spin the cylinder in one direction at high speed to remove the water from clothing

2-5. To minimize wrinkling of polyesters and poly-cottons

2-6. To hold the water and cleaning ingredients

B. Equipment/Part

1. Washer-extractor
2. Shell
3. Extract motor
4. Automatic cool-down device

2-7. What safety precaution should you take when loading or unloading a washer?
1. Turn off the power
2. Line up the openings in the shell and cylinder
3. Use the safety switches
4. Secure door latches

2-8. Why should you weigh every load before putting it in the washer?
1. To prevent breakdowns caused by overloading
2. To prevent unsatisfactory cleaning caused by overloading
3. To prevent waste of water and cleaning supplies caused by overloading
4. All of the above

A. Starting the cylinder
B. Adding detergent through the supply door
C. Moving the apron down and out of the way
D. Closing the cylinder door and securing the latches
E. Adding water to the proper level and at the proper temperature

Figure 2A

2-9. Refer to figure 2A, which contains some of the steps in manual operation of washer-extractors used afloat, but not necessarily in order given. In what order are the steps taken?
1. A, E, B, D, C
2. C, D, A, E, B
3. E, B, A, C, D
4. C, D, E, B, A

2-10. At what point in the washing cycle should you release the dump valve?
1. When the water level gage reads zero
2. After each bath time has elapsed
3. Before starting the cylinder
4. When you are adding detergent to the cylinder

2-11. Which of the following is NOT provided by the washer-extractor?
1. Reduction of the number of rinses per wash
2. Elimination of the step of transferring the wash load from the washer to the extractor
3. Elimination of the need of the sour bath for white clothes
4. Reduction in the time of each washing cycle

2-12. What is the purpose of the inch button on the washer-extractor?
1. To stop the washer temporarily during the washing cycle
2. To correctly position the cylinder for loading and unloading
3. To act as a safety stop for the cylinder
4. To engage the cylinder brake when the machine is being loaded or unloaded

2-13. The recommended method for cleaning scum from the outside of a washer is to wash it daily with
1. soap and hot water
2. an oxalic acid solution
3. a solution of calcium and magnesium salts
4. a solution of sodium bicarbonate

2-14. The Laundryman assigned to operate washers is also responsible for which of the following duties?
1. Reporting the need for emergency repairs
2. Performing minor maintenance
3. Keeping lubrication and maintenance charts and ensuring that schedules are followed
4. Each of the above

Learning Objective: Determine the difference between the use of hard and soft water in the laundry process, and how the different types of water can be used effectively.

2-15. Why would it be unsatisfactory to use soap when you must wash with hard water?
1. The soap is precipitated and fails to remove soil from the garment
2. Scum is deposited on the clothes
3. Both 1 and 2 above
4. The water feels oily and leaves a greasy deposit on the clothes

2-16. What salts of calcium and magnesium can be removed from temporary hard water by boiling?
1. Bicarbonates
2. Sulfates
3. Nitrates
4. Chlorides

2-17. Permanently hard water may be softened by
1. using lime soaps
2. using high-titer soaps
3. distilling or adding chemicals
4. boiling

2-18. The base-exchange method of softening water replaces water's calcium and magnesium with
1. sodium
2. lime
3. zeolite
4. silicates

2-19. Which of the following soils can be removed with water alone?
1. Earth
2. Soot
3. Sugar
4. Paint

2-20. Which of the following fabrics has/have a great affinity for alkalies and absorb(s) large quantities of them during the washing process?
1. Cotton
2. Wool
3. Linen
4. All of the above

In questions 2-21 through 2-24, select the type of detergent from column B that is most suitable for the purpose in column A.

	A. Purpose	B. Detergent
2-21.	Laundering 100 percent cotton (white and colored) in soft and hard water	1. Type I 2. Type II 3. Type III
2-22.	Laundering synthetic blend garments in sea water	
2-23.	Laundering white synthetic fabrics in soft and hard water	
2-24.	Laundering woolens and colored synthetic garments in soft and hard water	

2-25. Which of the following statements regarding the properties of Type I and Type II detergents is NOT correct?
1. They contain surface active agents that change the surface properties of water so that dirt can be more easily removed
2. In addition to optional brighteners, they have germicidal and stain-removal properties
3. They have compounds that keep the loose soil from redepositing on fabrics
4. They contain mildly alkaline salts that act as water softeners

2-26. Why should alkalies be used sparingly in wash water?
1. They harden the wash water
2. They tend to lower the tensile strength of fabrics
3. They dissolve the fibers of fabrics
4. They cause soaps to curd and clog the washer

2-27. What is the most effective alkali to use as a builder in soaps for washing paint-stained cloth?
1. Borax
2. Sodium silicate
3. Sodium bicarbonate
4. Trisodium phosphate

Learning Objective: Recognize the procedures for washing fabrics following the proven formulas.

2-28. You can find information on the proper water level and temperature for each type of wash load by checking what source?
1. The washing machine manufacturer's instruction manual
2. The formulas prescribed for Navy use
3. The directions on the containers for cleaning supplies
4. The gages on the washers

2-29. You should NOT deviate from the recommendations of the washing formula when washing heavily soiled clothes.

2-30. When should the water level for a laundry bath be lower than normal?
1. When low-titer soap is to be used
2. When liquid supplies are to be used
3. When the load is heavily soiled
4. When steam is to be added

2-31. What is the maximum variation in water bath temperature when you are washing polyester and polyester/cotton blends?
1. 30°F
2. 25°F
3. 20°F
4. 15°F

2-32. Prior to being washed, blood stained hospital linens should be given a cool down rinse at which of the following temperatures?
1. 65°F
2. 75°F
3. 85°F
4. 90°F

2-33. The procedure for laundering woolens in hard water may be found in which of the following?
1. NAVSUP Publication 487
2. Manufacturer's washer-extractor operation manual
3. Navy Formula V
4. All of the above

2-34. During the washing process, liquid detergent improves the removal of soil from oil-retentive type synthetic blends.

2-35. The amount of chemical supplies that are added to the washer during the washing process is ordinarily determined by which of the following?
1. Navy washing formulas
2. Manufacturer's washer-extractor operation manual
3. The capacity of the washer
4. Each of the above

2-36. A sour-blue product is used as a final step in washing which of the following articles?
1. Woolens and nonfast colors
2. Synthetic-blend whites
3. Synthetic-blend colored - khaki, dungaree, etc.
4. Each of the above

2-37. What laundry operation is called the "break"?
1. First bath
2. Last suds bath
3. First rinse
4. Last rinse

Learning Objective: Determine the procedure for washing various types of fabrics utilizing hard and soft water.

2-38. When you must wash laundry (synthetic-blend whites) with sea water, what water should be used?
1. Fresh (soft) water for the first step only
2. Sea water for the seventh step only
3. Fresh (soft) water for steps four, five, and six only
4. Sea water for steps four, five, and six

2-39. Which of the following procedures is recommended for washing woolen blankets?
1. Water at Navy Formula V temperature, running the machine at a slow speed for short periods
2. Water at tap temperature, running the machine at a fast speed for short periods
3. Hot water, running the machine at a slow speed for short periods
4. Hot water, running the machine at a fast speed for short periods

2-40. For washing permanent press and polyester blends in the laundry, which of the following directions is NOT correct?
1. Add nonionic detergent as the load is being wet down
2. Load the washer-extractor to only 75% to 80% of capacity
3. Limit the change of water temperature 20°F until the final rinse temperature is reached
4. Add detergent and alkali as the load is being wet down

2-41. What is the primary difference between washing impregnated gloves and socks and impregnated jumpers and overalls?
1. Only gloves and socks are run through the three clear water rinses
2. The machine be stopped during the draining and refilling cycles for gloves and socks only
3. Only gloves and socks must be washed for 15 minutes
4. Only gloves and socks should be washed in a maximum water temperature of 90°F

2-42. After clothes have been dried in the dryer, how long and at what temperature should they be tumbled?
1. Ten minutes at room temperature
2. Ten minutes at 155°F
3. Three minutes at 90°F
4. Five minutes at 155°F

2-43. What should the maximum water temperature be when you are washing impregnated clothing?
1. 160°F
2. 155°F
3. 100°F
4. 90°F

Learning Objective: Recognize the steps taken to bleach and strip fabrics.

2-44. What is/are the purpose(s) of bleach in laundering?
1. To remove stains
2. To sterilize the clothes
3. To whiten cotton fabrics
4. All of the above

2-45. What should be the minimum water bath temperature before bleach is added to the washer-extractor?
1. 130°F
2. 140°F
3. 165°F
4. 170°F

2-46. Bleach is added to white cottons and linens during the
1. break
2. suds bath
3. first rinse
4. last rinse

2-47. When a dark cotton sock gets into a load of heavily soiled white clothes by accident, color from the sock discolors the whites. What treatment is most likely to undo the damage?
1. Using a high potency liquid titanium stripper
2. Using a vinegar solution
3. Boiling the whites, and then bleaching them in sunlight
4. Rerunning the white through the complete, recommended wash and rinse cycle

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Learning Objective: Determine the purpose and procedures for the laundry sour, bluing, and starching processes.

2-48. For which of the following purposes would laundry sour be used?
1. To neutralize alkalies
2. To remove rust stains
3. To set certain fabric dyes
4. All of the above

2-49. Which of the following directions for starching shirts in a washer is correct?
1. Always starch white and colored shirts separately
2. Starch at a low suds water level with water at 100°F
3. Run the machine for 6 minutes for the starching to be effective
4. Remove the shirts from the starch solution before draining the load

2-50. How is starch removed from the bodies of shirts?
1. The shirts are put through a wringer
2. The shirts are pressed between layers of sheeting
3. The water level for the shirts at the end of the starch run is raised 8 or 10 inches and then dumped
4. The shirts are rinsed by hand

Learning Objective: Identify the machine used in the laundry for extracting and drying.

2-51. Which of the following machines removes the proper amount of moisture from different types of clothing to ensure good ironing?
1. Washer-extractor
2. Tumbler dryer
3. Single-unit extractor
4. Portable extractor

2-52. Which of the following factors determine(s) the extracting time of washed clothing?
1. Capacities of the washer-extractors
2. Atmospheric conditions
3. Type of clothing being handled
4. All of the above

Learning Objective: Determine the correct procedure for extracting water from clothes.

In questions 2-53 through 2-55, select from column B the probable cause of the trouble listed in column A.

	A. Trouble	B. Cause
2-53.	Garments have hard-set wrinkles	1. Extracting time was too short
2-54.	Garments are too dry for proper finishing	2. Excessive extracting
2-55.	Garments are too damp for effective pressing	3. Extracting time was too long

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Learning Objective: Determine the correct procedures for operation, care, and maintenance of the tumbler-dryer.

2-56. To replace the air that has been exhausted, how does heated air enter the cylinder of the tumbler-dryer?
1. Through an intake fan in the top of the cylinder
2. Through steam pipes entering the cylinder
3. Through perforations in the cylinder
4. Through a hose fitted into the base of the cylinder

2-57. While the laundry is in operation, all lint filters and screens should be checked and cleaned every
1. 8 hr
2. 2 hr
3. 24 hr
4. 4 hr

2-58. How often should tumbler-dryer ducts and vents be inspected and cleaned?
1. Weekly
2. Daily
3. Monthly
4. Quarterly

2-59. How often should the tumbler-dryer steam coils be cleaned?
1. Daily
2. Weekly
3. Monthly
4. After each shift

2-60. In the operation of the tumbler-dryer, what is the principal reason for shipboard laundry fires?
1. No automatic temperature control on tumbler-dryers
2. No automatic cool-down cycle on tumbler-dryers
3. Operator's error
4. Fluctuating steam pressures

2-61. Which of the following oils spontaneously heats at 212°F?
1. Lubricating
2. Fuel
3. Linseed
4. Each of the above

2-62. To allow the steam to build up gradually when the tumbler is being preheated, what arrangement is made?
1. The steam inlet valve is cracked to heat the machine slowly
2. The dampers are shut
3. The steam trap is opened completely
4. The steam pressure is reduced

2-63. In tumbler-dryers currently being installed on board Navy ships, how many minutes are required to dry 20 pounds (dry weight) of clothes?
1. 30
2. 20
3. 10
4. 5

2-64. The temperature range of the dryer should be between 140°F - 160°F for which of the following fabrics?
1. Cottons
2. Linens
3. Synthetics
4. All of the above

2-65. Too much lint in the heater chambers of a dryer increases the danger of
1. operational breakdown
2. power loss
3. fire
4. leaking valves

2-66. What is the effect of the accumulation of lint on the operation of the tumbler?
1. It increases the temperature of the air in the tumbler
2. It increases the steam pressure in the tumbler
3. It reduces the speed of the tumbler cylinder
4. It reduces the flow of air into the tumbler

Assignment 3

Extracting and Drying (continued); Flatwork Ironing; Pressing and Finishing

Textbook Assignment: Pages 66 through 98

Learning Objective: Recognize the correct procedures for tumble drying impregnated clothing.

3-1. What is the maximum temperature at which protective clothing may be dried in a drying tumbler?
1. 150°F
2. 155°F
3. 160°F
4. 170°F

3-2. How many times can impregnated clothing be laundered before it loses its protective quality?
1. 5
2. 2
3. 3
4. 7

3-3. To reduce the maximum tumbler drying temperature when protective clothing is laundered, what procedure is followed?
1. One bank of heater coils is shut off at the inlet connection only
2. One bank of heater coils is left open at the outlet connection only
3. One bank of heater coils is shut off at both the inlet and the drain connection
4. One bank of heater coils is left open at the drain connection only

A. Close the cold air damper and open the warm air damper
B. Clean lint screens
C. Operate the tumbler for 15 minutes without the load
D. Close the steam intake and drain valves on one bank of the heater coils

Figure 3A

- In answering questions 3-4 and 3-5, refer to figure 3A, which lists the procedures that are taken to prepare the tumbler dryer for drying impregnated clothing, but not necessarily in the order given.

3-4. In what sequence are the procedures taken?
1. A, B, C, D
2. B, C, D, A
3. C, A, D, B
4. D, B, A, C

3-5. For what purpose was step C performed?
1. To ensure that the tumbler does not exceed the maximum drying temperature during the drying operation
2. To ensure that any lint inside the tumbler is expelled
3. To check for proper recirculation of the drying air
4. To preheat the dryer, which is necessary when drying impregnated clothing

Learning Objective: Recognize the procedures for operating the flatwork ironer and recognize ironer functions.

3-6. What is the main purpose of the flatwork ironer used in a large Navy laundry?
1. To relieve pressure on the tumblers
2. To finish underwear and handkerchiefs
3. To finish table and bed linens
4. To finish towels

3-7. What type of power is used (a) to heat a flatwork ironer and (b) to operate it?
1. (a) electricity, (b) steam
2. (a) steam, (b) electricity
3. Both (a) and (b) steam
4. Both (a) and (b) electricity

3-8. Which of the following is NOT a maintenance or repair duty of a Laundryman who operates flatwork ironer?
1. Adjusting roll pressure
2. Removing and replacing roll padding and covers
3. Maintaining the steam connections
4. Changing the feed ribbons

3-9. If your ship has one of the Navy's smallest size ironers, what width tablecloth, unfolded, is the largest the ironer will take?
1. 36 in.
2. 50 in.
3. 54 in.
4. 60 in.

3-10. To prevent injury to the operator's hands, what safety device(s) should be used on flatwork ironers?
1. A finger guard
2. Feed ribbons
3. A pressure release wheel
4. An apron

3-11. How does a Laundryman preheat his flatwork ironer?
1. He keeps the main steam valve partially open for 20 minutes and then turns on the steam full force for 25 minutes
2. He opens the valve bypassing the steam trap and partially opens the main steam valve; after 30 minutes he closes the bypass valve and fully opens the main steam valve
3. He turns the steam on full force for 45 minutes
4. He brings the cylinder in contact with the padded rolls, keeps the main steam valve partially open for 10 minutes, and then turns the steam on full force

3-12. Which of the following precautions should you take with the bypass valve when heating a flatwork ironer?
1. Never open it when the steam is turned on
2. Close it immediately after the operation is completed
3. Be sure it is open when the iron is in operation
4. Close it before the iron is completely heated

3-13. What total time, in minutes, is needed to preheat both the cylinder and the roll?
1. 15
2. 30
3. 45
4. 60

3-14. After you finish ironing table linen and before you start on heavier bedspreads, you should adjust the pressure on the rolls by turning the
1. cylinder
2. front roll
3. handwheel
4. rear roll

3-15. If a new Laundryman leaves a flatwork ironer with pressure on while he is absent for 20 minutes, what is the likely consequence?
1. The cylinder will be damaged
2. The ironer will overheat and may burn out a bearing
3. The steam connections will begin to leak
4. The roll padding and apron will be scorched

3-16. Running a flatwork ironer with the pressure off will cause
1. damage to the apron
2. loss of contact of the drive rolls with the cylinder
3. scorching of the cloth covers
4. failure of the handwheel

3-17. Flatwork should be put through the ironer with the "wrong side" up in order to
1. prevent scorching the right side of the material
2. prevent wearing through the smooth side of the material
3. give a smooth finish to the right side of the material
4. exert more pressure on the rough side of the seam

3-18. What procedure should be used to feed 72 inch wide sheets into a 75 inch ironer?
1. One man feeds the unfolded sheets into the ironer
2. Two men feed the unfolded sheets into the ironer rollers
3. Two men feed two folded sheets into the ironer
4. Each of the above

3-19. At what part of the cylinder should small items be fed?
1. Center
2. Left end
3. Along entire length
4. Right end

A. Stopping the motor
B. Tightly closing the main steam valve
C. Opening the bypass valve

Figure 3B

- In answering question 3-20, refer to figure 3B, which lists the steps that the Laundryman performs when he secures the flatwork ironer, but not necessarily in the order given.

3-20. In what sequence are the steps performed?
1. A, B, C
2. A, C, B
3. C, B, A
4. B, A, C

3-21. When securing the ironer, what actions should the Laundryman take to protect the rolls and apron?
1. Feed a piece of crushed paper in the ironer and release the pressure
2. Feed a piece of heavy duck in the ironer and release the pressure
3. Feed a piece of heavy duck in the ironer and increase the pressure
4. Feed a piece of paraffined cloth in the machine and release the pressure

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Learning Objective: Determine the procedures for the care and maintenance of the flatwork ironer.

3-22. What kind of wax is used on the cylinder of the flatwork ironer?
1. Carnauba
2. Beeswax
3. Paraffin
4. Spermaceti

3-23. What is the first step in changing an apron on the flatwork ironer?
1. Cutting the old apron
2. Removing the old apron
3. Fastening the new apron to the old apron
4. Running the new apron over the rolls

3-24. On a flatwork ironer, when should you change (a) the padding and (b) the roll covers?
1. (a) When the padding is badly scorched or no longer resilient, and (b) whenever the covers are badly scorched
2. (a) Once a month, and (b) every week
3. (a) When the padding is worn unevenly, and (b) when the covers split or tear
4. (a) Every three months, and (b) when the cover is scorched.

3-25. On the flatwork ironer illustrated in figure 6-1 in this manual, what is the circumference of each fully padded ironer roll?
1. 20 inches
2. 18 inches
3. 16 inches
4. 6 3/8 inches

A. Remove pressure on the rolls and tension on the apron
B. Put a 72 inch top cover on each roll
C. Glue a muslin binder to each roll
D. Apply a piece of knitted padding to each roll
E. Clean rolls thoroughly

Figure 3C

- In answering question 3-26, refer to figure 3C, which lists steps that are used in repadding and recovering ironer rolls, but not necessarily in the order given.

3-26. In what sequence should the steps be performed?
1. E, D, A, B, D
2. A, E, D, C, B
3. A, E, C, D, B
4. E, A, C, D, B

3-27. For proper adjustment, which of the following numbered padding rolls requires finger tightening?
1. No. 1
2. No. 2
3. No. 3
4. Each of the above

3-28. A Laundryman can make his feed ribbons last longer by
1. removing and laundering them
2. coating them with a thin, clear shellac
3. cleaning them with a brush and cleaning fluid
4. soaking them overnight in cleaning fluid

3-29. Which of the following maintenance actions is NOT performed weekly by the engineering department?
1. Inspecting safety guard and interlock switch
2. Tightening loose nuts and screws
3. Filling oil and grease cups
4. Adjusting tension of sprocket chains and V-belts

In questions 3-30 through 3-35 select from column B the trouble that results from the cause in column A.

A. Causes

3-30. Poor rinsing during the wash cycle

3-31. Low steam pressure in the ironer

3-32. Ironer not waxed

3-33. Work allowed to air dry before ironing

3-34. Careless feeding into the ironer

3-35. Improper cleaning of the cylinder

B. Troubles

1. Flatwork wrinkled or rough
2. Flatwork comes out damp
3. Flatwork curls as it is fed into the ironer
4. Flatwork gets discolored

Learning Objective: Identify the various presses and auxiliary equipment used in the laundry, their component parts, and the purpose for which they are used.

3-36. Which of the following fabrics can be pressed on hot head presses?
1. Cotton only
2. Wool only
3. Wool and dacron
4. Cotton and wool

3-37. What part of a laundry press is called the head?
1. The heated metal top of the press which is brough down upon the buck
2. The steam trap that provides an outlet for condensed steam
3. The air pocket on top of the press
4. The system of levers that brings the press down and locks it

3-38. On a typical press, the steamlines are connected to the
1. buck
2. garment table
3. head
4. metal frame

3-39. What type of press has no pedals or levers?
1. Tapered head
2. Rectangular head
3. Triple head
4. Semiautomatic utility

3-40. Which of the following items is NOT considered to be auxiliary equipment for pressing and finishing?
1. Spray gun
2. Puff iron
3. Hand iron
4. Ironing board

In questions 3-41 through 3-44 select from column B the press equipment that is used for the press job in column A.

A. Jobs

3-41. Pressing shirt collar and cuffs in one operation

3-42. Pressing trousers in one complete operation

3-43. Removing wrinkles from the shoulders of shirts and coats

3-44. General pressing, such as a shirt back

B. Equipment

1. Puff iron
2. Vertical pants press
3. Triple head press
4. Rectangular head press

3-45. A unit in a ship's laundry consists of a set of presses placed together so that the presses can
1. use the same steam valve
2. use the same lay bar
3. be handled by one operator
4. be serviced simultaneously

Learning Objective: Determine the procedures for maintaining presses and identify the press safety devices.

3-46. Which of the following air pressures is satisfactory for a press?
1. 70 psi
2. 90 psi
3. 110 psi
4. 130 psi

3-47. Laundry presses are equipped with which of the following safety features?
1. Pushbuttons
2. Gages
3. Valves
4. All of the above

A. Two pieces of double faced flannel
B. Steel wool pads
C. A covercloth

Figure 3D

- In answering question 3-48, refer to figure 3D, which lists the materials that are used to pad a buck, but not necessarily in the order given.

3-48. In what sequence do you apply these layers to the buck?
1. A, B, C
2. C, B, A
3. B, C, A
4. B, A, C

3-49. When two layers of flannel are used in the padding, when should you change them?
1. Change both layers each week
2. Change both layers every two weeks
3. Change one layer each week, putting the new layer on the bottom
4. Change one layer every two weeks, putting the new layer on the bottom

3-50. Normally, what layers of padding may be used the longest?
1. Knitted padding
2. Steel wool padding
3. Flannel
4. Covercloth

3-51. Approximately how often should the metal pad of a small flat bed press with spring padding on a small ship be replaced?
1. Yearly
2. Every two years
3. Every three years
4. Every four years

3-52. You are working on a flat bed press without spring padding, and you find that the metal press pad needs replacement. What designation is required when you request a new metal press pad?
1. "For use over springs"
2. "For use on bare buck"
3. "For use with a 50 oz felted nylon pad"
4. "For use with a treated asbestos boot"

3-53. If the steam traps are NOT operating properly, what effect does this have on the operation of the press?
1. The foot pedal is hard to operate
2. The head will not return to its full upright position
3. The head and buck will not heat uniformly
4. The head will not lock

3-54. Which of the following maintenance on laundry presses is performed semiannually?
1. Removing all air filters and cleaning them in solvent
2. Inspecting steam and drain connections for tightness
3. Checking foot pedal pressure that is required to lock the head
4. Replacing broken or missing lubrication fittings

Learning Objective: Determine the probable cause of failure of a press to operate properly.

In questions 3-55 through 3-59 select from column B the trouble that may result from the causes in column A.

A. Causes

3-55. Clogged port hole in the cylinder

3-56. Dry bearings in lever assembly

3-57. Scorched or compressed padding

3-58. Defective master valve

3-59. Insufficient air pressure

B. Troubles

1. Garments rough when pressed
2. Press head closes slowly
3. Press head does not lock
4. Press head does not open

3-60. When your press opens and closes with a jar, what action should you take to remedy the trouble?
1. Clean the air line strainer and lubricate the cylinder
2. Repair the timer and adjust the pressure
3. Check the adjustment of the hydraulic check and the throttle valve on the main air line
4. Check the pressure at the compressor and adjust for maximum pressure

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Learning Objective: Recognize the steps of the procedure for operating a laundry press.

3-61. Before starting the day's pressing, which of the following steps is NOT taken by the Laundryman?
1. Examining the cover and padding and replacing if needed
2. Adjusting the pressure with the control knob or wheel
3. Opening the steam valve completely and preheating the press for 30 minutes
4. Making several presses prior to heating the press

3-62. Under which of the following conditions should you avoid using the press?
1. When a check shows the head may be lowered with hand pressure with light pressure on the foot pedal
2. When one pushbutton on the table is not operating
3. When the air pressure gage reads 80 lbs
4. When the steam pressure is 100 psi

3-63. What is the minimum number of lays a Laundryman may use for pressing the front of a shirt?
1. 1
2. 2
3. 3
4. 4

A. Yoke
B. Left shoulder
C. Collar and cuffs
D. Right shoulder
E. Right back

Figure 3E

● In answering question 3-64, refer to figure 3E, which lists the first five lays ordinarily used in pressing shirts, but not necessarily in the order given.

3-64. Select the arrangement that list the sequence in which the lays are performed.
1. C, D, B, A, E
2. C, B, A, D, E
3. A, D, B, C, E
4. E, D, B, A, C

3-65. When you are pressing a pair of trousers, the first step is to
1. straighten out the pockets
2. straighten the waistband
3. pull the trouser legs taut
4. match the inseams

3-66. Which of the following items should be pressed on a covered head press?
1. Khaki garrison caps
2. Cotton ties
3. Worsted ties
4. Cotton handkerchiefs

Assignment 4

Assembling and Issue; Drycleaning and Finishing

Textbook Assignment: Pages 99 through 129

Learning Objective: Determine the steps required to ensure the proper, timely, and orderly assembly and issue of finished laundry.

4-1. As articles of individual clothing are pressed and folded, they are placed in

1. piles of similar articles on a table or shelf
2. laundry bags
3. appropriate bins
4. boxes

4-2. Laundryman Jones is folding a shirt in the ship's laundry. At what point in the folding process does he bring the folding form down on the top of the back of the shirt?

1. After the tail has been folded up
2. Before the front is buttoned
3. After a crease has been carefully formed in back
4. After folding the sleeves across the upper back

4-3. An individual lot of laundry should be checked for which of the following before it is returned to its owner?

1. Cleanliness
2. Stains and blemishes
3. Proper creasing and smoothness
4. All of the above

4-4. When you can NOT wrap the laundry bundle immediately, what should be done with the laundry list?

1. Place the unfolded list on top of the articles
2. Place the unfolded list between the first two articles
3. Place the folded list on the top of the articles
4. Place the folded list between the first two articles

4-5. When should a laundry list be checked against the laundry you are assembling for return?

1. When you bin each item
2. When you put items from each bin into a bundle
3. Both 1 and 2 above
4. When you inspect the items

4-6. Which of the following articles should the laundryman place on top of the individual bundle?

1. Tumbled work
2. Flatwork
3. Shirts
4. Underwear and socks

4-7. Where on a tied bundle should you place the laundry list?

1. Inside the bundle, at the bottom
2. Inside the bundle, on top
3. On the outside of the bundle, on the top
4. On the outside of the bundle, on the end

4-8. When the recommended system for handling bulk lots is used in the ship's laundry, what procedure(s) should the laundry petty officer and the division petty officer follow?

1. Sign the Bulk Lot Laundry Log upon the issue of the finished work
2. Weigh the laundry bag
3. Sign the "received by" and "delivered by" columns of the Bulk Lot Laundry Log
4. All of the above

4-9. You are handling flatwork consisting of sheets, towels, mattress covers, and bedspreads. How should you assemble these for issue?
1. Tie and wrap similar items together
2. Tie similar items together and put the items into the laundry bags in which they were delivered to the laundry
3. Wrap in lots consisting of 2 wheets, 2 towels, 1 mattress cover, and 1 bedspread together, and mark the contents on the outside of the bundle
4. Put all of each item together and tie tightly with string

4-10. When should you reprocess finished articles of individual clothing which fail to pass inspection?
1. After the individual bundle has been delivered to its owner
2. When the Laundryman finds time for reprocessing
3. Immediately, so that delivery will not be delayed
4. After the day's workload has been completed

4-11. Which of the following procedures should be used when you are issuing laundry from an issue room?
1. Hang coats on hangers
2. Hang trousers on hangers
3. Arrange bundles on shelves in alphabetical order
4. All of the above

4-12. When should laundry be issued to individual owners or other authorized persons?
1. When it is completed and wrapped
2. As indicated on the laundry schedule
3. When the laundryman finds the time to deliver laundry
4. At the end of the work week

Learning Objective: Identify the steps taken for effective operation of the ship's drycleaning plant.

4-13. What factor(s) determine(s) the number of personnel that are assigned to a ship's drycleaning plant?
1. Whether or not drycleaning facilities are available ashore
2. The amount of drycleaning to be handled and the amount of equipment aboard
3. The number of officers assigned to the ship to be serviced
4. All of the above

4-14. Which of the following factors influence(s) a schedule for processing drycleaning?
1. Space limitations
2. The expected workload
3. Available equipment
4. All of the above

4-15. Which of the following statements about loading the two compartments of a drycleaning washer is correct?
1. The loads in each compartment must have the same dry weight and the materials must be of the same kind
2. The loads in each compartment must have the same dry weight, but the materials may be of different kinds
3. The loads in each compartment may have different dry weights, but the materials must be of the same kind
4. The loads in each compartment may have different dry weights and the materials may be of different kinds

4-16. What is a major reason for group scheduling of drycleaning?
1. It simplifies the setting up of uniform loads
2. It saves sorting time
3. It is easier for personnel to remember the schedule
4. It increases the amount of work that can be turned out each day

4-17. If your ship has a synthetic unit and it can handle 30 pounds dry weight in a load, how many hours will be required to process 225 pounds of garments?
1. 8
2. 7 1/2
3. 3
4. 5

4-18. Which of the following actions will help save time and work besides being an invaluable aid in preventing the possibility of misplacing items of clothing?
1. Training personnel assigned in only one phase of the drycleaning process
2. Receiving and issuing articles in a space other than the assembly room
3. Utilizing a drycleaning list
4. Processing one person's bundle at a time

4-19. When you are preparing a drycleaning list for your plant, what information need NOT be included?
1. Identification of the customer
2. A listing of articles to be cleaned
3. Marking up charges
4. Customer and plant counts

4-20. Under what circumstances is more than one master tag stapled to the drycleaning list used in shipboard drycleaning plants?
1. When items other than uniform parts are included in the bundle
2. When a customer brings in a bundle on two successive days
3. When a customer has more than eight items in his bundle
4. When parts of the bundle must be finished later than the bulk of the bundle because of heavy spots

4-21. What is a difference between methods A and B for receiving and identifying drycleaning?
1. The patron fills out the drycleaning list in A; the receiving clerk in B
2. The receiving clerk tags the articles in B; no tagging is done in A
3. The receiving clerk fills out the drycleaning list in A; the patron in B
4. The patron tags each article in A; no tagging is done in B

4-22. The removing of uniform accessories is a part of what drycleaning operation in a Navy cleaning plant?
1. Classification
2. Receiving
3. Inspection
4. Marking

4-23. You are preparing an officer's coat for cleaning and find two snapshots in a pocket. What should you do with them?
1. Give them to your immediate superior
2. Notify the customer and ask him to call for them
3. Put them in an envelope and staple the envelope to the customer's drycleaning list
4. Remove them, but put them back in the pocket before returning the coat to the customer

● Information for questions 4-24 and 4-25. You have classified four kinds of loads:
A. Blues
B. Foul weather jackets and winter trousers
C. Blankets
D. Table covers, drapes, and flags

4-24. To which of the above loads can you add face masks?
1. A
2. B
3. C
4. D

4-25. Black ties may be added to what load?
1. A
2. B
3. C
4. D

4-26. How many pounds of clothing should be cleaned for each 1 gallon loss of valclene solvent?
1. 200
2. 350
3. 450
4. 400

4-27. If a spot is NOT noticed and treated before the general cleaning of the garment, what is done to remove the spot?
1. The spot is treated after cleaning and then the entire garment is recleaned
2. Post spotting with the right solvent is all that is necessary
3. The entire garment is recleaned at once
4. Soap and water is tried on any spot that remains after the cleaning process

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Learning Objective: Recognize how drycleaning machines function and the steps taken to maintain them in good working condition.

● Questions 4-28 through 4-31 refer to characteristics of a hot type drycleaning unit. Mark each statement True or False.

4-28. It uses nonflammable solvents.

4-29. It requires a minimum of space.

4-30. It is used more efficiently in small plants.

4-31. It minimizes the handling of clothes.

4-32. Solvent can be completely purified by the process of
1. filtering
2. distillation
3. separation
4. rinsing

4-33. Which of the following operations is performed only by the hot unit?
1. Returning the washing solvent back to the washer for rinsing the load
2. Filtering the cleaning solvent
3. Distilling the cleaning solvent
4. Tumbling and drying the load

Learning Objective: Recognize the characteristics of drycleaning fluids and how they are used with the filter unit.

4-34. What synthetic solvent is most commonly used in Navy drycleaning units?
1. Carbon tetrachloride
2. Perchlorethylene
3. Benzine
4. Gasoline

4-35. Which of the following characteristics makes Valclene the solvent of choice for Turboclene drycleaning?
1. It has a slow rate of vaporization
2. It eliminates the need for recovery tumblers
3. It has a high boiling point
4. It is nontoxic

4-36. When a Laundryman in a Navy drycleaning plant uses soap with a solvent, he may determine the proportions of the mix needed by
1. referring to instructions furnished by the manufacturer of the soap
2. using a test kit and the manufacturer's instructions
3. the type of load being cleaned
4. the supplier of the solvent

4-37. In the filter unit, how are impurities removed from the solvent?
1. By being forced through a tube filled with diatomaceous earth
2. By being heated until it vaporizes and gives up its impurities
3. By being strained through many layers of cotton mesh
4. By being forced through a series of screens, each of which is coated with filter powder

4-38. Which of the following statements about the filter unit is correct?
1. The filter screens should be coated weekly with filter powder
2. After the filter is cleaned at the end of the day, activated carbon in solvent should be circulated through the filter
3. The filter may require shaking down during a single day's operation
4. Each of the above

4-39. Impurities and color are removed from the drycleaning solvent by
1. running the solvent through the filter while no garments are being cleaned
2. adding activated charcoal to the solvent and running the unit without garments
3. shaking down the filter and allowing the unit to cool down
4. running the unit empty, then removing the filter and washing it in a solution of borax

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Learning Objective: Determine the procedures for operating the still and for tumbling and separating clothes.

4-40. What is likely to happen if the cooling system in the still of a Navy drycleaning unit fails to function?
1. The drycleaning unit will overheat
2. Poisonous gas will seep out of the still
3. The still will lose its pressure
4. Fluid in the drycleaner may explode

4-41. Which of the following items will deodorize most quickly in a tumbler?
1. Silk ties
2. Woolen trousers
3. Pea jackets
4. Winter coats

● Questions 4-42 through 4-44 are statements pertaining to handling garments during drycleaning. Mark each statement as True or False.

4-42. Mechanical action and heat must be carefully controlled.

4-43. All fabrics require the same treatment by the drycleaner.

4-44. Time of run and amount of heat to be used may be found by consulting the manufacturer's technical manual and the drycleaning formulas.

4-45. What is the maxim temperature at which soft woolens should be dried in a drycleaning tumbler?
1. 120°F
2. 230°F
3. 140°F
4. 150°F

4-46. What should you do to eliminate strong solvent odor from garments that have been drycleaned?
1. Increase the tumbling time
2. Decrease the tumbling time
3. Reclean them
4. Rely on the steam pressing to eliminate the odor

4-47. At what stage of the drycleaning process is spot removal very difficult or impossible?
1. Prior to the general cleaning of the garment
2. After the general cleaning of the garment
3. After tumbling the garment
4. After steam pressing

Learning Objective: Recognize the steps of the procedure for operating shipboard drycleaning machines.

- Questions 4-48 through 4-57 refer to the VIC Model 22CO drycleaning machine.

4-48. How many gallons of solvent are required to operate the VIC Model 22CO drycleaning machine?
1. 65
2. 105
3. 125
4. 135

4-49. The relief valve that controls the pressure of the drum is preset at what pressure, in pounds per square inch?
1. 7 1/2
2. 10
3. 15
4. 20

4-50. A full precoat is required every time the filter pump is shut off.

4-51. How many pounds of garments may be washed during each operation?
1. 15
2. 30
3. 45
4. 60

4-52. Prior to each wash run, how many pounds of filter aid should be added to the strainer housing?
1. 1
2. 2
3. 1 1/2
4. 1/2

4-53. When solvent recovery is in operation with the garments in the cylinder, how much steam pressure, in pounds per square inch, is maintained on the pressure gauge?
1. 55
2. 45
3. 35
4. 30

4-54. When you make a batch soap run, which, if any, of the following dial indicator settings may be used to regulate the soap run?
1. 9 through 13
2. 7 through 13
3. 5 through 13
4. None of the above

A. Remove the lint cleanout door
B. Clean the lint out of the lint bag and hang the bag up to dry
C. Run the machine for five minutes
D. Return the selector, washer, and fan switches to off position, and shut off the water

Figure 4A

4-55. Figure 4A lists the steps (not necessarily in the order given) that are required to shut down the drycleaning machine after the steam is shut off to the recovery coil. In what sequence are the steps taken?
1. C, D, A, B
2. C, B, A, D
3. D, C, A, B
4. A, B, C, D

4-56. You are authorized to start the still before the filter has been allowed to precoat.

4-57. How many pounds of clothing are normally cleaned before the oil is drained from the still?
1. 500
2. 600
3. 800
4. 900

● Questions 4-58 and 4-59 refer to the Turboclene Model FDC -4 drycleaning machine.

4-58. Drycleaning fluid that remains in the machine after it has completed its draining cycle is removed by
1. spinning
2. vacuum
3. distillation
4. wringing

4-59. Hot water is used in the drycleaning procedure to
1. heat the still which heats the solvent
2. rinse the cylinder after each load is removed
3. aid in recovering the solvent laden air
4. dilute the cleaning solvent for the rinsing cycles

Learning Objective: Recognize (1) the procedures for operating drycleaning presses, and (2) how various articles of uniform should be pressed.

4-60. When pressing a uniform coat that is made of 100 percent dacron material, you use a short time interval during any period that the press head is in contact with the coat. To prevent damage to the coat, you should use (a) what mechanical pressure and (b) approximately what press temperature in degrees Fahrenheit?
1. (a) Low; (b) 250°
2. (a) Medium; (b) 250°
3. (a) Low; (b) 275°
4. (a) High; (b) 330°

● Questions 4-61 through 4-65 refer to the process of pressing.

4-61. Which of the following directions applies to pressing both the left fly front and the left side pocket?
1. Keep the fly front even with the back edge of the buck
2. Place the left trouser top on the small end of the buck
3. Keep the pocket in the center of the buck
4. Apply medium to heavy pressure before drying

4-62. The lay for pressing the left hip pocket requires that the back center seam be placed even with the
1. front edge of the machine
2. rear edge of the buck
3. center of the buck
4. front edge of the buck

4-63. In pressing the seat of the trousers, where should the back seam be placed?
1. Near the front of the buck
2. In the center of the buck
3. Toward the rear of the buck
4. Drawn over the large end of the buck

4-64. In pressing the front portion of the leg, you must position the trousers so that the
1. crotch is at the small end of the buck
2. leg is lying well to the front of the buck
3. outside of the leg is facing upward
4. side seams are lying one on the other

4-65. In which of the lays illustrated in figure 9-12 in your textbook should the left leg back crease be pressed well up into the seat?
1. No. 1
2. No. 2
3. No. 3
4. No. 4

● Questions 4-66 through 4-70 refer to the process of pressing officers' sack coats.

4-66. What lays illustrated in figure 9-13 of your textbook are used so that the left and right fronts of the coat will hang evenly when they are pressed?
1. Nos. 1 and 2
2. Nos. 1 and 3
3. Nos. 2 and 3
4. Nos. 3 and 4

4-67. What procedures should you use to press the collar of an officer's sack coat?
1. Press the collar first on the wrong side
2. Press the sides of the collar on the large end of the buck and the center of the collar on the small end
3. Press the collar on the right side to shrink it if it has been stretched
4. Press each side of the collar with the lapel and press the center separately

4-68. When you are pressing the right half of the coat back, how many inches from the front edge of the buck should the bottom of the seam be placed?
1. One inch
2. Two inches
3. Three inches
4. Four inches

4-69. What device should you use to press uncreased coat sleeves?
1. A rolled up towel
2. A sleeve board
3. A sleeve former
4. A shoulder steamer

4-70. The procedures for pressing the shoulders of a coat include which of the following?
1. Turning the shoulder inside out to press it
2. Holding the shoulder against the steam head
3. Applying steam to the shoulder before pressing
4. Both 2 and 3 above

4-71. In addition to steam, what device should be used to bring up the nap on a peacoat?
1. A damp cloth
2. A vacuum line
3. A soft brush
4. A stiff brush

4-72. When you press open a seam, what rules should be followed?
1. Dampen the material, then use the shop press
2. Steam lightly, then use the shop press
3. Dampen the material, then use the hand iron
4. Steam slightly, then use hand iron

Assignment 5

Removal of Spots and Stains; Decontamination and Disinfecting; Portable Laundry Equipment

Textbook Assignment: Pages 130 through 160

Learning Objective: Recognize the characteristics of spots and stains, the agents used for their removal, and the effect that spot removal may have on fabrics.

5-1. When a spot becomes a stain, what is the usual reason?
1. The spot has dried into the fabric
2. The spotted garment has been immersed in water
3. The wrong solvent has been used to treat the spot
4. Heat or chemical action has set the spot

5-2. What is the difference between a spot and a stain?
1. A stain can not be removed without damage to the fabric
2. A stain must be treated before the garment is cleaned
3. A stain can be removed with the proper treatment
4. A stain is the result of drycleaning before spot treatment

5-3. Before the spotter can remove a spot from colored material, what information should he have?
1. What caused the spot or stain
2. What fibers make up the material
3. What effect the cleaning solution will have on the dye
4. All of the above

5-4. The owner of a spotted garment can best assist the drycleaning plant by
1. drawing a chalk circle around the spot on his garment
2. washing the garment before sending it to the laundry
3. tagging the garment with a label bearing the word, "SPOT"
4. attaching a note telling the cause of the spot

5-5. In a busy ship's laundry, inspecting every article for spots and early spot removal is usually not feasible. What precautions should be taken against setting stains?
1. Washing blood-stained or badly soiled items before they are sent to the laundry
2. Sorting of sick bay items in sick bay before they are sent to the laundry
3. Examining all items that are to be pressed before applying heat to them
4. All of the above

5-6. When attempting to remove spots from a shirtsleeve, the spotter should place the garment on the
1. sleeveboard
2. small end of the spotting board
3. perforated end of the garment tray
4. opposite end of the spotting board away from the chemical tray

5-7. A spotter uses the steam gun for
1. applying the chemical spot remover
2. drying the garment after spot removal
3. blowing chemicals and spots through the fabric
4. dissolving the cleaning agents

5-8. To prevent permanent damage to the fabric during spot removal, how should the spotter hold the steam gun?
1. Perpendicular to the fabric at all times
2. At a 45° angle with the fabric at all times
3. At a distance of 4 to 5 inches from the fabric at all times
4. In conjunction with the perforated area of the spotting board

5-9. For what purpose should you use a spotter's spatula?
1. To remove solid materials from jars and bottles
2. To apply mechanical action as an aid to the cleaning chemicals
3. To feather solvents and thus prevent the formation of a ring
4. Each of the above

5-10. If you do NOT have a chamois skin available to absorb the spotting solutions, you may substitute which of the following?
1. Cheesecloth
2. A turkish towel
3. A blotter

5-11. Which of the following materials are used for (a) feathering out and (b) testing the fastness of a dye?
1. (a) Blotters, (b) toweling
2. (a) Cheesecloth, (b) chamois
3. (a) Cheesecloth, (b) blotters
4. (a) Toweling, (b) blotter

A. Oxalic acid
B. Sodium chloride
C. Acetone
D. Ammonia

Figure 5A

● In answering questions 5-12 through 5-15, refer to Figure 5A, which lists chemicals that are used to remove spots and stains.

5-12. Which chemical is especially useful in removing rust?
1. A
2. B
3. C
4. D

5-13. To remove fruit stains, the spotter will probably use
1. A
2. B
3. C
4. D

5-14. When the spotter has removed a stain with hydrochloric acid, which chemical will he use to neutralize the action of the acid?
1. A
2. B
3. C
4. D

5-15. To remove stains resulting from resins, paints, or nail polish, which chemical is used?
1. A
2. B
3. C
4. D

Learning Objective: Recognize the methods and steps of procedure taken for the removal of stains, the tools and equipment used and the precautions to be observed during their removal.

5-16. What is the relationship between a solvent and a solute?
1. The solvent dissolves in the solute
2. The solute dissolves in the solvent
3. The solvent is suspended in the solute
4. The solute is suspended in the solvent

5-17. What is/are the correct method(s) used for removing soils and spots from fabrics?
1. Mechanical spatulation
2. Steam gunning
3. Both 1 and 2 above
4. Chemical dissolution

5-18. Which of the following stains will dissolve in cold water or regular washing but may be set in hot water?
1. Fruit juices
2. Black coffee
3. Blood
4. Ice cream

5-19. What advantage does prespotting have over the practice of spotting after cleaning?
1. It minimizes the danger of a ring
2. It avoids the need to reclean the garment
3. It removes spots more effectively
4. All of the above

5-20. The purpose of an emulsifier is to
1. remove grease
2. prepare a spot for safe bleaching
3. increase the solubility of certain substances, such as grease
4. decrease the danger of damaging a fabric by mechanical action

5-21. When you are removing spots, which of the following procedures should NOT be followed?
1. Use a magnifying glass to examine a spot
2. Always use a steam gun as the first step in spot removal
3. Avoid using hypochlorite bleach on fabrics made from animal fibers
4. Test first on a hidden part of the garment whenever there is doubt as to the safety of a spotting process

5-22. In spotting, what part of a spatula should be used?
1. The front end
2. The side of the point
3. The flat center
4. The tip of the point

5-23. To obtain the best results, how should you use the spotting brush?
1. Apply smooth, even pressure as you work the brush back and forth
2. Apply strong pressure on the toe of the brush as you brush with firm tapping strokes
3. Apply pressure on the heel of the brush as you brush with firm tapping strokes
4. Apply pressure on the side of the brush as you work the brush in a circular motion

5-24. A spatula may NOT be safely used on which of the following fabrics?
1. Cotton
2. Wool
3. Linen
4. Silk

Learning Objective: Determine the contents of spotting formulas and the purpose for which they are used.

5-25. Lacking satisfactory commercial products, a spotter aboard ship can make up a formula of one part each of acetone, chloroform, ethyl acetate, synthetic methanol, and water, with six parts of castile soap for use as a
1. wet spotter
2. prespotting soap
3. paint remover
4. general spotting formula

In questions 5-26 through 5-29, select the spotting formula from column B that is used for the spot in column A.

	A. Spots	B. Formulas
5-26.	Paint on cotton dungarees	1. General formula
5-27.	Tar spot on a uniform sleeve	2. Paint remover
		3. Prespotting soap
5-28.	Ink stain on white cotton jumper	4. Wet spotters
5-29.	Oily spot on a necktie	

Learning Objective: Recognize the personnel responsible for preventing the spread of NBC contaminants, and the measures taken in the ship's laundry to assist in preventing their spread.

5-30. Decontamination after a nuclear, biological, or chemical (NBC) attack may NOT be carried out in the laundry for which of the following?
1. Sick bay towels
2. Rubber boots and slickers
3. Leather shoes
4. Work clothing worn by decontamination crews

5-31. Following an NBC attack, what personnel aboard ship are responsible for initial monitoring and for identifying contamination?
1. Damage control
2. Laundry
3. Medical
4. All of the above

5-32. What kind of contamination and proper control measures would the medical officer be responsible for determining?
1. Biological attack
2. A shipboard epidemic
3. Both 1 and 2 above

5-33. When laundry personnel handle contaminated clothing, they should wear protective clothing and their shirt cuffs should be
1. tied outside their gloves and trouser cuffs tied to their ankles
2. inside the tops of their gloves and trouser cuffs pushed inside their socks
3. inside the tops of their gloves and trouser cuffs over their boots
4. loose over long gloves and trouser cuffs loose over high boots

5-34. When there is a shortage of suitable protective gear, which of the following is a good emergency measure for protecting laundry personnel from inhaling contaminated material?
1. Wearing a rubber mask
2. Wearing a respirator
3. Tying a clean handkerchief to cover the nose and mouth
4. Wearing a Navy oxygen-breathing apparatus

5-35. In order to protect yourself while you are handling contaminated materials, which of the following should you avoid?
1. Smoking and drinking only
2. Drinking and eating only
3. Smoking and eating only
4. Smoking, eating, and drinking

5-36. When contaminated clothing items are brought into the laundry, and prior to the clothing being put into the washer, which, if any, of the following procedures is correct?
1. Once the clothing is in the laundry, no special handling should be required
2. The clothing is isolated in closed containers, then it should be transferred as directly to the washer as possible
3. The washing of all other clothing should be stopped until the contaminated clothing is out of the laundry
4. Arrangements should be made to have it laundered elsewhere

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Learning Objective: Identify the methods and washing formulas used in the laundry for decontaminating various articles of clothing and the safety precautions observed while performing these functions.

5-37. When necessary, which of the following variables may be modified in laundry decontamination?
1. Type of supplies added to wash water
2. Amount of supplies added to wash water
3. Water temperature and length of cycle
4. Water levels

5-38. You have brushed several wool uniforms to reduce radiological contamination. The clothing is safe to wear under which of the following circumstances?
1. The contamination occurred at least a week previously
2. You have followed instructions about decontamination by brushing
3. A designated monitor has checked the uniforms for level of radioactivity and found them safe

5-39. When radiologically contaminated clothing is being decontaminated by aging during storage, what determines the length of time the clothing must be stored before it can be safely used?
1. The fabric of which the garment is made
2. The method of storage
3. The radiation level of the garment as determined by monitoring
4. The type of garment

5-40. Before the laundry receives clothing that is contaminated by radioactivity, it should be
1. brushed
2. vacuumed
3. shaken
4. monitor for radiation levels

5-41. Formula C is specially adapted for laundering clothing contaminated above the tolerance level because it includes a
1. sour bath
2. chelating agent
3. neutralizer
4. chlorine compound

5-42. Which of the following products serves both as a water softener and as a chelating agent?
1. Calgon
2. Versene
3. Quadrofos
4. Each of the above

5-43. When the water used has a hardness of 12 grains, how many additional ounces of Calgon must a Laundryman add to soften the water in a 25 lb washer extractor at a 12-inch water level?
1. 7 oz
2. 10 oz
3. 3 oz
4. 4 oz

5-44. When cotton uniforms lightly contaminated by radioactivity are to be laundered, which of the following formulas is correct?
1. Use 2 suds baths and 3 hot rinses
2. Wash for a total of an hour and then use 2 rinses plus a sour
3. Wash through 3 suds baths and 3 rinses at temperatures ranging from 100°F to 140°F, according to formula
4. Wash at 160°F and rinse at 100°F

In questions 5-45 through 5-47, select the laundry formula from column B that should be used in laundering items contaminated by radioactive matter as described in column A.

	A. Items	B. Formulas
5-45.	Sheet and towels with light contamination (below the tolerance level)	1. A 2. B 3. C
5-46.	Cotton work clothes heavily contaminated (above tolerance level)	4. D
5-47.	Woolen blankets lightly contaminated	

5-48. Radioactive contamination should be removed from rubber gloves and boots by
1. hosing and scrubbing with a detergent solution
2. immersing in calcium hypochlorite for 4 hours
3. boiling in water for 15 minutes
4. laundering with the formula C laundering process

5-49. Cotton clothing contaminated by chemical agents may be treated by
1. laundering with the formula C laundering process
2. airing and then laundering with the formula D laundering process
3. airing and then laundering with the formula E laundering process
4. boiling in water for 15 minutes and then laundering with the formula D laundering process

A. Boil in water for 30 minutes
B. Air, and then launder with formula D or E
C. Tumble in the dryer, using hot air

Figure 5B

5-50. Refer to figure 5B, which lists the three methods used to disinfect articles that have been chemically contaminated, but not necessarily in order given. Which alternative arranges the processes in the order of preference?
1. A, B, C
2. B, C, A
3. B, A, C

5-51. Rubber ponchos that have been exposed to chemical contamination should be decontaminated by
1. airing and then laundering with the formula D laundering process
2. boiling in water for 30 minutes
3. immersing for 4 hours in a solution of calcium hypochlorite and water
4. exposing to hot air circulation in the tumbler dryer

5-52. Wool blankets used in the sick bay during an epidemic should be disinfected in the washer by
1. adding steam to the rinse water to bring the temperature to 180°F
2. laundering with suds and rinse baths at 150°F
3. laundering by formula D and adding quarternary ammonia to the last rinse
4. laundering by formula D and exposing the blankets to hot air circulating in the tumbler dryer

5-53. Cotton sheets, pillow cases, and towels used in sick bay during an epidemic must be disinfected. The Laundryman who does the job would probably be instructed to
1. add steam to the wash water to bring the temperature up to 150°F
2. add steam to the rinse water to 100°F
3. add an ammonium compound to the first suds bath
4. have the washer lubricated after disinfecting articles at a high temperature

Questions 5-54 through 5-58 are statements concerning recommended procedures for protecting personnel, equipment, and disinfected items. Mark each item True or False.

5-54. All disinfected items are put in clean spaces, and linens are protected by wrapping them in clean paper or delivering them in clean laundry bags or baskets.

5-55. The insides of washers do not require special cleaning.

5-56. No special care is needed to clean the laundry spaces.

5-57. Personnel should bathe and shampoo after completing a decontamination job.

5-58. Clothing worn by Laundrymen during decontamination should be washed before reuse and monitored for safety.

Learning Objective: Determine the requirements necessary for operation of a portable laundry unit.

5-59. In a portable laundry unit, what is the capacity of the steam generator most commonly used?
1. 390 lb per hr
2. 450 lb per hr
3. 690 lb per hr
4. 800 lb per hr

5-60. How much water is required to operate a portable laundry unit for a normal laundry shift?
1. 3,100 gal
2. 3,400 gal
3. 3,700 gal
4. 4,000 gal

5-61. A concrete foundation is required for the portable laundry unit because of the strong vibration of the
1. washer-extractor
2. steam generator
3. tumbler dryer
4. motor

5-62. What fuel(s) is/are acceptable for the steam generator?
1. No. 3 fuel oil
2. No. 2 fuel oil
3. 80 octane gasoline
4. Both 2 and 3 above

Learning Objective: Recognize the duties and responsibilities of the personnel assigned to a portable laundry unit.

5-63. At an advanced base, who is responsible for the maintenance of laundry machinery and the operation of the steam generator?
1. The engineering officer
2. The laundry supervisor
3. The supply officer
4. The Laundryman who is assigned as machine operator

In questions 5-64 through 5-69, select the Laundryman from column B who performs the duty in column A.

	A. Duty	B. Personnel
5-64.	Weighing clothes and making up suitable loads	1. Presorter 2. Machine operator
5-65.	Maintaining a record sheet for each lot of laundry and signing the identification record	3. Final sorter 4. Laundry supervisor
5-66.	Procuring supplies	
5-67.	Assembling finished work	
5-68.	Keeping machines and surrounding area clean	
5-69.	Inspecting clothes received from dryer for damage and noting this on record sheet	

Learning Objective: Identify the procedures for operating the portable laundry unit and the safety precautions observed while operating the unit.

5-70. How many pounds of laundry are loaded in each pocket of the washer-extractor?
1. 16
2. 18
3. 20
4. 21

5-71. After opening the outer shell door, when the cylinder stops running, each compartment door is opened by stepping on the brake pedal and
1. releasing the inch buttons
2. releasing the door catches
3. pressing the lock handle down
4. pressing the lock handle upward

5-72. Which of the following features on a washer-extractor are designed primarily for safety of operation?
1. Inching buttons
2. Latches on compartment doors
3. Foot-operated drain valves
4. Interlocks

5-73. What safety precaution should you take regarding gasoline that is stored and handled in the laundry unit?
1. Store gasoline in an airtight metal drum
2. Keep gasoline containers in a cool place and away from direct sunlight
3. Do not smoke when handling fuel
4. All of the above

5-74. Who should perform major repair work on the laundry's steam generator?
1. The laundry supervisor
2. The laundry's machine operator
3. The engineering personnel, if available
4. The electrician

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